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The World Power Conference.

IT is now six years since the first plenary meeting of the World Power Conference was held at Wembley. It is fitting that this important step towards international scientific collaboration should have been held here, not only on account of the attraction of the British Empire Exhibition to a large number of foreign engineers, but also because the conception of the conference was due to this country in the person of Mr. D. N. DUNLOP, director of the B.E.A.M.A.

In between Wembley year and the present time there have been two sectional conferences, the one on fuel in London in 1928 and that at Tokio last autumn.

Mr. DUNLOP continues his interest in the work as chairman, with Mr. C. H. GRAY as secretary, of the International Executive Council of the second World Power Conference which will open at Berlin on Monday next for a 10 days' meeting.

This year 36 countries are to be represented and 400 papers will be presented, over 40 of which are by British authors. The papers fall under 34 subject headings and, while many of them may not appear at first glance to be of electrical interest, it may be said that nearly all are connected with electricity, either directly or indirectly.

A feature will be the scheme of simultaneous speech transmission, by which it will be possible to follow the addresses and discussions in any of the three official languages of the conference—English, French, and German.

Apart from the more academic side of the conference, elaborate arrangements have been made for visiting recent outstanding achievements of engineering in Germany, which should add materially to its educational value, and, although the conference will be conducted on entirely international lines, some local colour will not come amiss. Engineers still turn for information to the volumes of the proceedings of the original conference. Much of the data then published is no doubt becoming obsolescent, and six years is probably as long an interval as is desirable between these plenary conferences. On the other hand, conferences at shorter intervals, taken in conjunction with those of a more national character, would probably not obtain the sup-

port they deserve. That they do deserve support on the ground of engineering progress is, we think, undeniable. We do consider, however, that underneath all such movements as are here exemplified lies something of a deeper significance to the human race. Political influences can do little more than provide a restraint on bellicose tendencies. These merely inhibitory, or negative, influences are not enough. We need what William James postulated as a moral equivalent of war. We believe that the most powerful equivalent will be the working together of engineers and other scientists of all nations to devise means for obtaining victory over the resources of nature.

The Faraday Centenary.

In this issue we publish a report of the progress which has been made up to date with the arrangements for the celebration next year of the centenary of Michael Faraday's discovery of electro-magnetic induction.

Every section of the great electrical industry which sprang from that discovery is doing its share towards honouring the great scientist and inventor, and strong committees have been formed to carry the celebrations through successfully.

The tribute which is to be paid to Faraday's memory will be enhanced by the simultaneous holding of the I.E.E. Summer Meeting and the 101st annual meeting of the British Association. Public interest will be aroused by a great exhibition at the Albert Hall which the British Electrical Development Association is organising on behalf of the I.E.E. With the co-operation of the leading associations of the electrical industry, it should be a memorable display, and an indelible impression should be made on the minds of thousands of visitors to the advantage of electrical development.

Prospects in New Zealand.

The Department of Overseas Trade report on New Zealand, which was reviewed last week, is better from the electrical point of view than many of the Department's publications. The author, Mr. W. D. Lambie, is deserving of credit for including an appendix which shows clearly how Great Britain stands with regard to her competitors in various branches of the Dominion's import trade, and he has given electrical goods a very fair showing in this appendix.

Although the population is not large, New Zealand is an important market, for its *per capita* purchases of imported goods are the highest of any country in the world. In addition to this the people are very advanced in the use of electricity, which means that they will require increasing quantities of electrical appliances and accessories.

It will be seen from our review that the value of electrical imports is showing a declining tendency. This is due mainly to the fact that the principal expenditure upon the Government's hydro-electric schemes is now completed, but an increased demand for electricity consuming devices—especially domestic appliances—may be confidently anticipated. The United Kingdom seems to have lost ground in one or two directions, although retaining the leadership. Our principal competitor is the United States, but in certain classes of imports Canada has made considerable progress. Mr. Lambie thinks that much of the success of the two North American countries has been due to their aggressive and effective sales methods. He admits, however, that many British firms are now paying closer attention to the needs and predilections of the market.

There is a definite preference in New Zealand for British goods which British traders should be careful to foster.

The E.R.A. and Electricity Supply.

An indication of the educational value of the I.M.E.A. Conventions may be found in the substantially increased support now accorded to the Electrical Research Association by the supply section of the industry.

The plea of Sir John Snell at last year's Convention —a plea that was emphatically endorsed in these columns —did not fall on deaf ears. It is, indeed, quite apparent that the large majority of engineers and committee men present must have used their persuasive powers to good effect on their return home.

Although the minimum financial support necessary for the continuation of the programme of the E.R.A. has been obtained, there is still a call for further effort. At the recent Convention it was reported that there are still electricity supply committees not convinced of the benefits of co-operative research—not convinced, that is, to the extent of contributing their quota.

Last week we published an opportune article by Mr. E. B. Wedmore in which the advantage to electricity supply undertakings of an independent research authority was regarded from a somewhat different angle. Stress was laid upon the utility of the E.R.A. as a disinterested medium in which supply engineers and manufacturers could discuss their common problems.

Labour Conditions Here and in France.

The rate at which the labour conditions of this country and those which exist in France continue to follow their course, but in opposite directions, is as alarming for us as it is disquieting for the French nation. Taken as a whole the difference in the two countries is truly amazing. While our own superfluity of labour is likely to reach 100 per cent. more than it was only a year or so ago, and represents at the present moment about 4 per cent. of our total population, in France the scarcity of skilled labour in all the heavy industries is inevitably and continually increasing the scale of wages. The immediate results are a general rise in the costs of production, and at a moment when the selling prices of many articles, in sympathy with the whole world, are on a decline. Statistics relating to the principal French towns show that as compared with 1911 the rates of wages actually paid to skilled workmen were multiplied by 7.5 in October, 1928, and by 8.32 in October, 1929, while, astonishing as they may be, the coefficients for unskilled and female labour are even higher, in spite of the three million foreigners usually resident in France. The figures for Paris are 6 and 7.2, respectively. It is again surprising that the cost of living has not progressed at the same rate, for in Paris, during the last quarter of 1929, the index was 5.65. It is therefore clear that the increase in wages is due more to shortage of supply than to high cost of living. While in England the anxiety of employers is how to employ their staffs profitably, the problem in France is rather how to produce at costs which will enable the articles to compete in the world's markets. Certainly the French situation is much less grave than our own, but the shortage of skilled labour there is rapidly becoming embarrassing. The logical course would be for some of our young and skilled workmen to take a trip to France, and it would not be a waste of time for those of them who are unemployed to endeavour to obtain information on the point from some of our Consuls.

Service Value.

In opening the discussion on domestic water heating at the recent I.M.E.A. Convention, reported elsewhere in this issue, Mr. A. E. McKenzie referred to the inadvisability of stressing the comparison of costs between electricity and coal or gas.

The important point is that by the electrical method consumers receive value for their money in better service. The chief problem is to discover the price they are prepared to pay for the service.

The relative costs of gas and electricity for lighting are not nowadays discussed; if electricity is available, it is used. The inference is obvious.

Ruskin Water-power Scheme.

An account of the 188,000-h.p. plant being constructed in Western Canada for the British Columbia Electric Railway Company.

By F. H. FULLERTON.

IN its journey from Stave Lake to the Fraser River the water of the Stave River will be utilised three times by the British Columbia Electric Railway Company. The site of the Ruskin development, the last of the chain of three plants, lies at a point on the Stave River, about 3½ miles downstream from the existing Stave Falls plant of the company, and near the junction of the Stave and Fraser Rivers. A general view of the scheme as it will appear when completed is given in fig. 1. After meandering through the terraced valley below Stave Falls, the river has cut its way deeply through a rock barrier that once blocked its course, and from which it debouches into the flood plain of the Fraser at little above tidal level. The lower section of the gorge thus formed affords the site for the development as shown in fig. 3. Strange as it may seem, the river, in cutting its way through a moraine barrier, which crossed the site, ignored the softer zones of glacier outwash that flanked, and probably covered, a spur of bedrock, and started to form its present channel by cutting in a quartering direction into the solid rock barrier. Once started it continued its erosion, and the formation of the Ruskin gorge, some 160 feet deep, with abrupt walls rising on either side, has resulted from its action. Borings have proved that the exposed bedrock at the rims of the gorge forms the highest points, and that the bedrock drops away on either side from these exposures. The plan of development has been conceived to meet the conditions imposed by the surface topography of the bedrock. There is no contributing watershed, as such, the water being drawn from the tailwater of the Stave Falls plant. The reservoir of the new plant will therefore function only as a forebay to regulate these waters, and only daily regulation will be possible. The average water supply there is estimated at 4,200 cubic feet per second, and the new reservoir will be 700 acres in area. Approximately a 130-foot head of water will be available, this being the total fall between the tail race of the Stave Falls plant, and the average height of water below the dam. The dam will make available in one spot the fall which takes place over a distance of three and one half miles. The elevation of the tail water, however, is variable, owing to the fluctuations of the level of the Fraser from the maximum in the freshet season to the low-water winter level. Daily variations of level will also occur at certain stages, owing to tidal influences.

The Stave Falls plant under full load will discharge into the forebay at the rate of about 7,100 cubic feet per second. The power plant will be situated on the east side of the river, immediately below the dam. At a point on the bank upstream the penstocks will convey the water from the tunnels to the turbines. One tunnel is being driven for

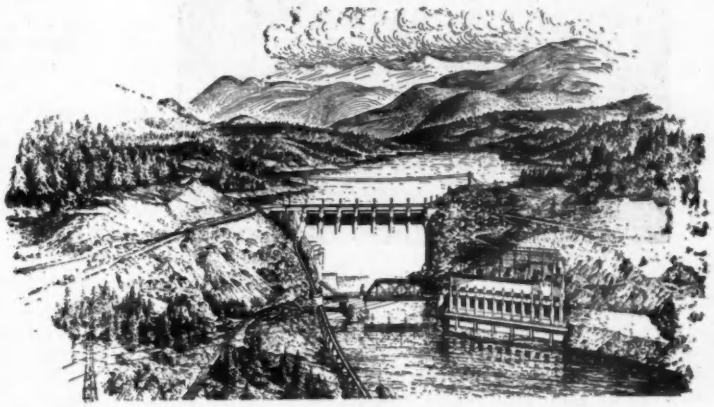


Fig. 1.—View of the Works when Completed.

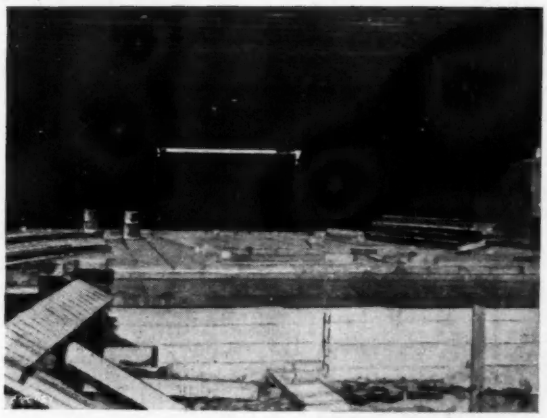


Fig. 2.—Interior of Flume.

Fig. 3.—Site of Power House before Clearance.

each turbine, and there will be ultimately four such tunnels. The initial installation will consist of one 47,000-b.h.p. unit, but the power house at present is being made large enough to permit the installation of a second unit, and the tunnel for conveying water to this second unit is now being driven. The ultimate capacity of the Ruskin plant will be 188,000 h.p.

Fig. 4.—The Flume under Construction.

The main dam as planned is to be a concrete structure, gavity section, crest overflow type, with seven bays of regulating gates set between piers, supporting a deck 31 feet wide which carries the gate-operating gear and a full width roadway. This dam will be 400 feet long on the crest, and 185 feet in maximum height from its foundations, and will contain 92,000 cubic yards of concrete. The aggregates will be obtained by dredging and pumping from the foreshore in front of the power house, which is about 1,500 feet distant from the dam. Some 35,000 cubic yards of boulders, loose rock, and top bedrock will be excavated to prepare the foundation for the reception of concrete. The excavation will have a maximum depth of 35 feet. Diversion of the river to permit excavation of the dam foundations and boring of the tunnels has now been completed. The big flume (figs. 2, 4, and 5) is of massive timbers resting

Fig. 5.—View of the Big Flume.

on three long concrete sills, and is 35 by 15 feet in cross section. The flume is now in operation, and on the average it has been filled to only from 12 to 15 feet of its depth since the river has been diverted through it. The flume is built close to the west bank of the canyon, and the tunnels that will lead the water to the power-house are now being bored through the solid rock of the east bank. Eventually the flume will be closed up with concrete and form part of the permanent dam.

Despite the difficulties involved in getting piling and cribbing in place in a water current of from 10 to 12 miles an hour, good progress has been made on the lower coffer dam, which is shown in fig. 10. The cribbing was securely anchored, sheet piling laid on the top, and the crevices and possible source of leaks at the base filled with tenacious blue clay. In all about 225 tons of sheet piling was used on this dam. Work on the upstream coffer dam (fig. 7) has also been completed, this work being done as soon as the flume was in use, as this diverted the flow and lessened the current where the dam was being erected. The cribbing on this dam has been anchored by huge boulders, some of them over five tons in weight, and here again an enormous quantity of sheet piling, cement, and blue clay was used.

After the building of these coffer dams work reached a critical stage by the pumping out of the area enclosed between the upper and lower coffer dams, in order to get at the bottom of the deep river bed. This space is being kept clear of water by a battery of electrically-driven centrifugal pumps, with a total capacity of 15,000 gallons per minute. There is also a diver with full equipment, and his aid is valuable in blocking up leaks in the coffer dams, and similar work.

Excavation work for the foundations of the dam, the progress of which is illustrated in fig. 6, has now been

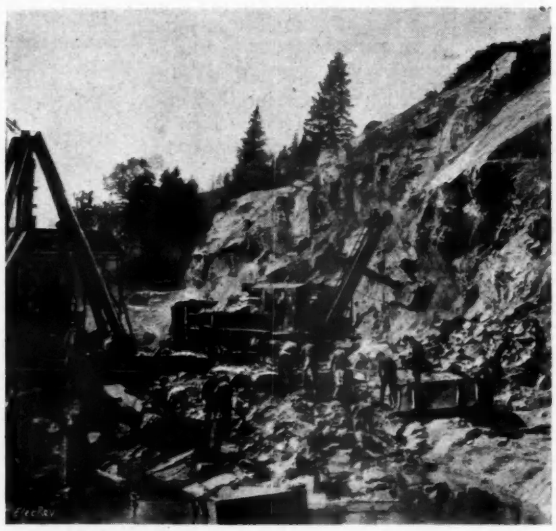


Fig. 6.—Excavating for the Dam.

practically completed, and foundation building is commencing. Dynamite is used to dispose of the largest of the obstructions, and a steam shovel is also in use in the gorge. The total length of the dam on the crest will be 400 feet, and its total height from its foundation in the river bed will be 185 feet. On the dam crest will be the seven overflow gates, each 33 feet wide. The roadway across the dam top will be illuminated at night by decorative fittings.

One of the novel features of this huge dam will be an inspection gallery, 6 by 4 feet in cross section, running from bank to bank, right through the heart of the dam. This inspection gallery is also arranged to serve as a drain and to show instantly any seepage or leakage.

A shingle bolt flume will be left on the west side of the dam to allow shingle bolts to be taken from the future Lake Ruskin down to the Fraser. This shingle flume will be four feet wide and three feet deep, leading from the surface of the lake with an easy slope that will move the floating timber along.

While all this activity has been going on at the dam site excavation work has been completed at the power house site (fig. 8). Here much the same procedure was followed as on the preparation for the dam. The contractors had to build a diversion to shelter the site, as it was necessary for excavation work to go below the bed of the river. For this diversion a smaller coffer dam was built around the site, and as this work was done in prac-

tically solid rock it was possible to make the coffer dam very tight, and one pump has been sufficient to keep the water down. The pouring of foundations has been completed, and already the walls of the building are being erected.

Fig. 7.—Up-stream Coffer Dam and Flume Intake.

Meanwhile excellent progress is being made on the two tunnels from the upstream face of the dam to the penstocks and generators in the power house. One of these tunnels is already bored for almost its entire length, and its intake is shown in fig. 9. These tunnels are being bored right through the solid rock, and their diameter of 24 feet will be lined with concrete and thus reduced to 21 feet in diameter. In length the bores will average about 300 feet. The tunnels will be connected to giant penstocks of heavy steel, with an inside diameter of 19 feet. These penstocks will be 80 feet in length, and they will convey the volume of water under nearly 100 lb. pressure direct to the turbine. Balanced valves will be provided for control of the lower end of the penstocks.

Fig. 8.—Preparing the Power-house Site.

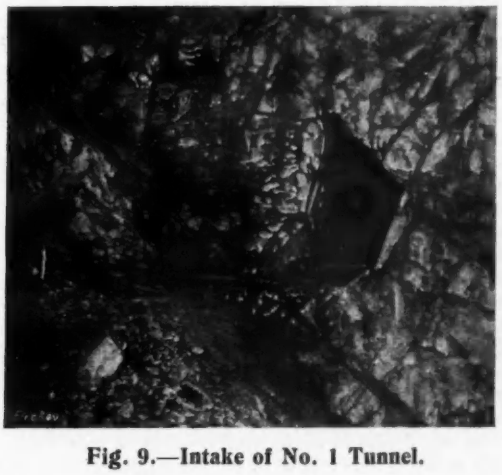


Fig. 9.—Intake of No. 1 Tunnel.

The power house will be a combination steel frame and reinforced-concrete building, which is being designed to house the first and second units. Nature, besides creating a wonderful power site at this canyon cut through the solid rock, was also kind enough to provide an ample supply of building materials for the huge dam. There is all the aggregate needed for the huge amount of concrete specified for this project along the banks of the river below the canyon. Bunkers have been built on the east side of the river, with a storage capacity of 4,000 cubic yards. Cable conveyors take the aggregate from the river banks and a large bar just below the site, and carry it to the bunkers. Here the material is automatically screened in four standard sizes ranging from fine sand to 6-inch section pieces.

This will be the first large concrete job in Canada using this size aggregate, as usually two- and three-inch aggregate and sand are used. The rock is of such good quality, however, that a very fine quality of concrete is being secured. The contractors expect to be able to pour between 800 and 1,000 cubic yards of concrete per day on the main dam.

Another big co-incidental project necessitated by the construction of this Ruskin power plant is the moving of the former electric interurban line along the Stave River valley from its old route (fig. 3) to a level 60 feet higher up the slope of the valley. If this were not done the artificial lake created by the dam would bury the electric railway line under 40 feet of water in many places. This involved the grading and rebuilding of more than four miles of standard gauge electric line. The rebuilt line was laid with heavier steel than was used on the former low level. In order to get the tracks to a sufficiently high level for the new route, it has been necessary to put in a grade of 3 per cent. A spur line about one quarter of a mile in length leads from the main line right into the power house, thus giving it railway communication throughout the country.

There are two aerial cable ways strung 175 ft. above the present river level on massive timber towers, the anchoring of these presenting a considerable problem. A special flat ribbon, or cable, has been designed, which has enormous tensile strength and gives no trouble from the twisting to which wire-rope cables are liable.

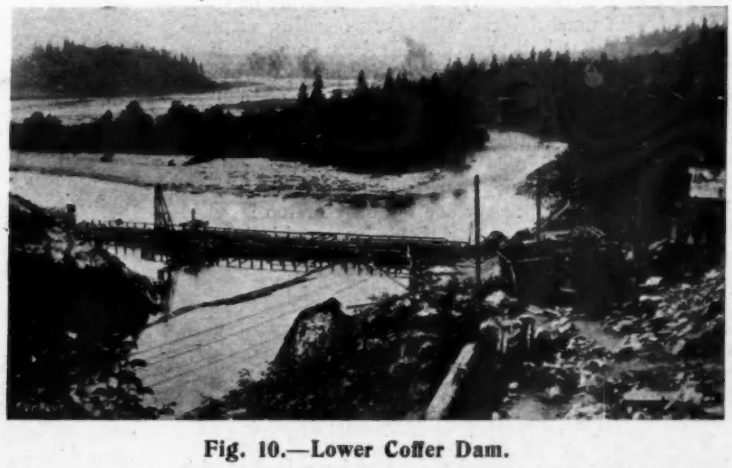


Fig. 10.—Lower Coffer Dam.

(To be concluded.)

Engineering and Financial Statistics.

Some criticisms of their method of presentation and suggestions for improved arrangement with a view to enhancing their practical utility.

By R. S. H.

THE general considerations with regard to electricity supply statistics advanced in the recent article entitled "The Official Fuel Returns"* apply equally to the publication now under review, which, it is suggested, is capable of improvement and extension to a similar extent.

In the financial section of this volume are to be found the figures that really matter, namely, costs and revenue per kWh sold.

With regard to the arrangement of the matter in it, consideration might be given to the possibility of regional grouping within the separate company and public authority sections to correspond roughly to the areas chosen for Central Electricity Board schemes. Separate sub-totals might be given so that figures for individual undertakings could be added or subtracted for particular purposes. As was mentioned earlier it is desirable that the full details, both technical and financial, should be available for every generating station; therefore, it is suggested that in the cases of undertakers who own more than one generating station, separate capital and revenue costs in each station should be shown. As has already been suggested, ease of reference would be increased if the fuel return and the main statistics volume bore against figures for corresponding stations and undertakers the same index number. In this publication, as in the fuel return, economy of space and cost should be possible without in any way curtailing the value of the statistics by the elimination of unnecessary figures; consequently, it is suggested that figures relating both to kWh and to costs and revenue should be shown to the nearest thousand only.

In this volume, even more than in the fuel return, graphs should be used. Of course, nobody ever reads the body of the book; a number of people may read the preface and the preliminary summary tables. Other than the few who are forced, only the more energetic or those endowed with much leisure will take preceding volumes and reckon out what progress has been made. How easy it would be to see graphed out for us all the points that matter over a period of years. This, of course, could be done more cheaply and doubtless more accurately once by the Commissioners than by a number of different individuals at different times and in different places in their spare moments. Besides, all those people who at present are too busy or too languid to work such things out for themselves could then be better informed on progress made in all directions, and particularly on the change in the shape of curves caused by Sir Archibald Page and his colleagues. For, of course, we expect him to change the direction of most of them quite substantially. Some of them, like percentage of reserve plant and overall costs per kWh generated we expect him to bend downwards, others like output, we expect him to bend violently upwards.

With regard to the engineering section of this book, there are only four special points to be raised at this stage. The first is that, in addition to capacity of electricity generating plant installed, there should be shown against each undertaker's name the capacity of sets sanctioned but not installed. This would bring up-to-date information contained in the Supplementary Particulars to C.E.B. schemes, as regards selected stations, and would avoid the necessity for reference to and tabulation from the Commissioners' annual reports.

Secondly, it is suggested that in cases where a station, or a system supplied from it, is interconnected with another station or system of supply, then the electrical capacity of the interconnector or interconnectors should be shown. (There might be an indication also as to whether the interconnection is for reciprocal supplies or for "one way traffic" only).

Thirdly, as everybody knows, the value of the load factor index is calculated from the winter's maximum load and the year's output of kWh, the termination of the year in different places being December, March, or May. Now, where the output of an undertaking is changing (and what undertaking is not progressing in these days?) a different value will be obtained if the kWh be taken for the year ended December, rather than for a year ending in the March or May following the December in which the maximum load occurred. The later the final month of the year of account after the month of maximum load, the higher will be the load factor in a steadily progressive undertaking, and the lower will be the load factor in a retrogressive undertaking; similarly the defect will be more marked the greater the rate of progress. Therefore, it is argued, the figures shown in the volume of statistics are not strictly comparable; the year ends in December for companies, in March for English municipalities, and in May for Scottish municipalities. In order that proper conclusions may be drawn from statistics, it is essential that all figures should be strictly comparable, and the defect now brought to light calls for correction. Two courses are open: the first is to use for all undertakings the kWh output for a common year, say the year ending March 31st, as in the fuel return; alternatively, there might be published the average of the monthly maximum demands on each undertaking, as already suggested with regard to the fuel return. This figure is of importance as it is the basis of the allocation of costs in base load stations between fixed and running costs (as was previously indicated), and also because it will be to some extent the basis of the charge for grid supplies by way of "statutory average kilowatts."

Fourthly, is it necessary to show the full analysis of kWh sold by each undertaking twice—once in the engineering section of the return and once in the financial section? Surely this is unnecessary duplication of labour and figures. It should suffice to show in the engineering section merely the total kWh sold, and for an analysis thereof to refer to the finance section where the corresponding revenue also is available. There would then be room in the engineering section for columns showing boiler pressures, temperatures, and capacities in detail—a much more useful function.

This brings us to the financial section of the return with its sixty-nine columns of figures. In this section of the return some considerable amount of change appears to be advisable mainly as the result of recent

* ELECTRICAL REVIEW, January 31st, 1930, p. 199.

developments. It is suggested that, in addition to the present subjective analysis of capital expenditure and costs (with regard to which some modification will be discussed later), it is desirable that there should be incorporated some objective analysis as a sub-division within the present form of the statistics. It is appreciated that, as with all statistics, it is essential that as far as possible continuity and comparability with existing statistics should be maintained. With these ends in view it is suggested that the new objective analysis should be under the following headings:—

1. Generation of electricity—as a sub-heading the capital and operating costs of each generating station should be shown.

2. Distribution of electricity—to include as sub-headings in the revenue account repairs and maintenance of distribution mains and plant and corresponding operating salaries and wages, rents, rates, &c., and in the net revenue account the appropriate interest and depreciation charges.

3. Sale and consumption of electricity—to include both capital expenditure and expenses in connection with advertising, showrooms, and apparatus hired out to consumers.

If this classification is adopted then there will be seen readily the full costs of generation at base load stations, which costs must in any case be calculated eventually under the terms of the 1926 Act.

The next point for discussion is the method of presentation of information in the publication. In this connection it is suggested that undue prominence is given to certain figures which are of minor importance, while other fairly important figures are not shown at all. It will not be questioned that a separate column should not be devoted to items of little weight while at the same time certain important figures which can be dissected are not.

The following proposals are therefore made:—

(*a*) Eliminate from capital expenditure the heading "main transmission," and include the component items under distribution, for who will say what is a main transmission line? What, also, is the use of the distinction? If such a line has to be tapped for giving a direct supply to a large consumer, it becomes part of the distribution system and is not a pure main transmission line. (In this connection it is suggested that there is an inconsistency in the table on page xxii of the prefatory memorandum, where "transmission lines, mains, and services" includes figures shown on the statistical form under "main transmission," and this by the directions on the circulated statistical form should include land, building, and plant. To the knowledge of the writer, at least one undertaking properly fills in this section of the form).

(*b*) Eliminate from the capital page the column headed "loans sanctioned," which does not seem to merit publicity, although the information, if on the statistical form, may be of use for internal purpose to the Commissioners.

(*c*) On the revenue pages expand the columns under "lighting and domestic" into three parts (at least) to show revenue and sales under lighting flat rates, heating flat rates, and together under two-part tariffs. Of course, this information is already available to the Commissioners, as it is called for on the statistical form. In this connection there is a minor point to which consideration might usefully be given. Is it not possible for the Commissioners to use their influence in order to obtain a full analysis of revenue? Those undertakings which are unable to show revenue and sales for lighting, heating, and power separately, should by now keep up-to-date records, and thus add to the value of their statistics and those for the whole country.

(*d*) The last four columns on the revenue page are not of great practical interest, and account for only 6 per cent. of the total revenue, while, on the other hand, only one column is devoted to lighting and domestic which covers 45 per cent. of the revenue. It is suggested that the four columns in question should be grouped together under "other revenue."

(*e*) On the expenses side it is suggested that "other costs of generation" should be expanded to show the details called for on the statistics form, and that, in order to provide space, the last four comparatively unimportant columns in the expenses should be grouped under "other revenue expenses."

(*f*) Combine the columns "interest from investments" and "exceptional revenue" under the heading "other net revenue account income," for no obviously useful purpose is served by their separation.

There remain only one or two isolated points calling for immediate comment. On the expenses page, the works costs per kWh in generating undertakings are compared with the cost of a bulk supply per kWh to other undertakings; this is not sound in all cases. It may be granted that before existing plant capable of generating is closed down the cost of an imported bulk supply, including capital charges, should be less than the running cost of the plant under consideration, but this is not the only case that may arise. It may be essential to replace old plant with new, or it may be that, through growth of connections, existing plant is not of sufficient capacity; in both these cases the costs (including capital charges) of an important bulk supply must be compared with the overall costs (including capital charges) of generation from new plant. Therefore, the existing comparison should not be emphasised, and consideration might be given to eliminating or modifying it.

With the existing statistical methods it is not possible to arrive at the full costs of operating each undertaking under separate headings, as balances of reserve funds regularly mysteriously disappear or diminish. The writer suspects that this is due to the growing habit on the part of accountants of charging all abnormal expenses against such reserve funds direct, instead of charging the expense against the revenue account and using the reserve funds as "cushions" to spread out the effect of the "blows" over a period of years. It is quite unnecessary to labour this point, as it is evident that the nature of all such charges should be disclosed.

It is suggested that it would be advantageous to follow the American idea and show the number of kWh sold and corresponding revenue for domestic purposes in homes against the number of such consumers. Some difficulties of definition may arise, but it is felt that any figures which could be collected would be of considerable interest.

It may not be immediately practicable, but for future guidance it is suggested that eventually the revenue pages should show for each undertaker, kWh sold and corresponding revenue at different ranges of voltages. As it is possible to eliminate one or more transforming stages and thus to economise in capital charges, high pressure or extra high pressure kWh can be sold more cheaply than low pressure kWh and to this extent bald figures of revenue and kWh are not strictly comparable.

The final point, which really is not related to the publication under consideration, is whether it is not possible for the Commissioners to arrange for the publication of quarterly figures of fuel consumed and maximum loads, to correspond to the kWh figures already published in the *Board of Trade Journal*. If such figures were made available to the electrical Press (and not hidden away in other publications such as the *Board of Trade Journal*), everyone in any way concerned could be much better informed with regard to movements within the industry.

The principal proposals made in this article may be summarised as follows:—

1. Group undertakings according to C.E.B. scheme areas with corresponding sub-total figures.

2. Separate capital and revenue costs for each generating station of an undertaker owning more than one station.

3. Use index numbers as in the fuel return.

4. Eliminate unnecessary figures by showing all figures relating to kWh and £'s to the nearest thousand.

5. Use graphs and charts.

6. Show capacity of generating plant sanctioned, but not installed, at the date of the return.

7. Show the electrical capacity of interconnections between generating stations and/or their systems of supply.

8. Standardise the year for the purpose of load factor calculation.

9. Publish the average of monthly maximum loads.

10. Eliminate duplication of analysis of kWh sold, which now appears both in the finance and the engineering sections of the return.

11. Show the capacities, pressures, and temperatures of boilers at each station installed and sanctioned.

12. So far as capital expenditure and revenue and net revenue expenses are concerned, arrange for a three part objective analysis:—

(*a*) Generation.
(*b*) Distribution.
(*c*) Sale and consumption.

13. Eliminate from the capital expenditure sheet the heading "main transmission" and distribute the amounts within the heading "distribution."

14. Dispense altogether with the heading "loans sanctioned" in the public authorities section of the return.

15. Dissect units sold and revenue for domestic supplies as between the separate flat rates and two-part rates.

16. Show separately the number of units sold and the revenue at different voltages, *e.g.* (1) low voltage; (2) 400-11,000; (3) 11,000-33,000; (4) 33,000 and over (or alternative standard transmission pressure stages).

17. Bring pressure to bear on those undertakers who do not render completely analysed figures.

18. Group together, under the heading "other revenue account income," the last four columns on the revenue page.

19. Give the full analysis of other works costs of generation.

20. Under the heading "other revenue account expenses" show one figure for the last four columns on the expenses page.

21. Show only one total figure for net revenue account income.

22. Cease to compare, without suitable qualification, the works costs per kWh with the overall costs per kWh of imported bulk supplies.

23. Show the disposal of amounts extracted from reserves.

24. Show the number of homes connected and the corresponding kWh sold and revenue.

25. Publish approximate quarterly figures of kWh generated, coal consumed, and maximum loads for all generating stations, or, alternatively, at least totals for the whole country (monthly figures would be better still).

Production Planning.

A study of production economics, with suggestions for avoiding seasonal fluctuations in output and for reducing delivery periods.

By A. W. WILLSMORE, F.R.Econ.S.

ONE of the most important problems facing the business manager at the present day is that connected with delivery possibilities. No longer do manufacturers get orders thrust upon them for shipment at their convenience. International competition for the available business is very keen, and delivery periods are often a deciding factor in the placing of a contract. The pre-war procedure of awaiting the receipt of an order before commencing manufacture is definitely unsuited to modern conditions. To meet existing delivery requirements production must be planned ahead on scientific lines, and work must be started in advance of the receipt of orders. Admittedly this practice involves a risk, but then the business manager is by nature a risk taker, and the more he relies on intelligent anticipation rather than elementary rule of thumb, the more successful will he be.

The Aim of Production Planning.

The term "production planning" involves the preparation of a forecast of the probable volume of orders to be received over a certain period, and the arrangement of production over that period to yield the best results consistent with (1) maintaining an even load on the manufacturing plant, (2) keeping delivery periods as short as possible, and (3) keeping investment in work-in-process and stocks at as low a level as possible. Obviously it is not possible to prepare a standard scheme of production planning suitable for universal application. Different businesses require different procedures to suit their peculiarities. We may, however, draw a broad distinction between two different types of manufacturing firms: those manufacturing goods for sale from stock, and those producing equipment to meet customers' specific requirements. Factories manufacturing lamps, radio receiving sets, domestic electrical appliances, wiring fittings and similar small pieces of apparatus, would fall within the former category. The object here is to ensure that stocks are maintained to give quick deliveries without involving unduly high inventories. The problems facing such manufacturers are not very complicated. In point of fact, the firms in this class who adopt production planning are the rule rather than the exception. It is felt, however, that the production plans are not always designed to yield the best results in the direction of an even manufacturing load. Ideally, the production plan of a firm should be such that seasonal variations in output are eliminated. The existence of conditions under which a factory stands practically idle for several months of the year, with a furious rush of work in the period of seasonally high demand, is very harmful to the human factor in that it destroys the regular habit of work, and leads many of the best workmen to seek steady jobs elsewhere, unless high pay is offered.

Meeting Seasonal Fluctuations.

Unfortunately, seasonality in demand cannot be avoided. It arises from deeply-rooted habits and fundamental conditions that cannot normally be circumvented. It is, for instance, useless to expect customers to buy lamps in even quantities throughout the year, when they probably do not require electric light at all in the summer months. The alternative is to plan production to meet the seasonal conditions by maintaining a steady rate of output and building up stocks in the summer months to be absorbed in the winter. This policy, of course, involves increased investment in stock. Against this must be set the fact, however, that the usual overheads and fixed charges have to be met, whether the factory be working at full pressure or at only 25 per cent. load. In addition, if production is confined to a few

months of the year heavier labour costs are involved in overtime pay. If the problem is treated on purely financial grounds and a careful investigation of relative costs is made, it will be found in many cases that the extra cost of financing stocks is approximately offset by the reduced unit cost of a regular output. The relationship will vary of course, depending upon the nature of the overhead charges. In brief, it may be said that the higher the labour and machinery cost, the more profitable it will be to spread production evenly over the period and build up stocks when demand is slack. Where the larger portion of the cost of an article represents material it may be relatively too expensive to carry heavy stocks for any long period. In such a case business economics dictates that inventories should be kept as low as possible by manufacturing close to actual requirements. Because a company decides, on financial grounds, not to spread its manufacturing load evenly throughout the year, it does not follow that there is no need for production planning. Plans are even more important under such conditions than in the opposite case, especially to enable arrangements to be made for training additional labourers for the busy period.

In passing, it may be mentioned that where a firm is manufacturing a seasonal article, but where production cannot, for financial reasons, be distributed evenly over the year, the disadvantages of intermittent production can often be overcome by the adoption of a second article with an opposing seasonality. For instance, radio set manufacturers might profitably adopt fans and domestic appliances to meet the summer slack period. Vagaries of seasonal demand can also be overcome by seeking new markets and by adapting the product. Radio manufacturers, for instance, specialise on portable sets for the summer months and also seek markets in southern latitudes where the seasons are opposite to what they are here. Whether the manufacturing policy is based on an even load throughout the year or whether it is designed to keep inventories at a minimum, the first step in production planning is the preparation of a forecast of future business. The most suitable period to cover is usually a year. It should be appreciated that it is by no means essential for the twelve months to start at January 1st and finish at December 31st. The period should, if possible, be so chosen as to start with the period of low seasonal demand.

Estimating Future Business.

Having chosen the period, the first step in production planning is the preparation on a monthly basis of an estimate of probable orders. A careful analysis of past results will give a reasonably accurate approximation of probable future orders. This estimate can be adjusted to allow for any special circumstances that are expected to influence the results. Where a decision has been made against the policy of levelling production peaks and investing in stock, the monthly production quotas will, of course, be equivalent to the sales estimates. Arrangements will be made in advance for the supply of materials, and steps will be taken to train additional staff in good time to handle the higher output required in certain months. In addition to the twelve months' estimate, however, a more carefully considered estimate covering only one or two months should be made regularly, to enable detailed plans to be arranged for handling business in the immediate future. These plans will include programmes for the actual work to be done by individual machines and men. Gantt charts will be prepared to obtain a picture of the probable condition in the shops and to enable the work to be laid out so that it is handled to the best advantage.

Need for Revised Estimates.

At regular intervals throughout the period, actual orders should be checked against estimated figures. This will show the need for any revisions to the original forecast and will indicate any necessary adjustments. Where production is to be maintained at a steady rate throughout the year, it will probably be necessary to start with a small stock to enable the heavy demand period to be handled. The sufficiency of the opening stock can be determined from a comparison between the anticipated monthly sales and their average. Assume, for instance, that the following represents the anticipated sales figures :—

	Estimate.	Less than average. i.e. surplus.	More than average. i.e. deficit.	Cumulative.
June	310	90	—	+ 90
July	320	80	—	+170
August ...	330	70	—	+240
September ...	390	10	—	+250
October ...	430	—	30	+220
November ...	490	—	90	+130
December ...	510	—	100	+ 30
January ...	500	—	100	- 70
February ...	450	—	50	-120
March ...	400	—	—	-120
April	360	40	—	- 80
May	320	80	—	—
Total	4,800			
Average ...	400			

It will be noticed that if a perfectly even output of 400 units is maintained, cumulative production will be short of demand by 120 units in February. Arrangements must be made to meet this condition, either by carrying an opening stock of 120 units or by increasing production in the months immediately preceding those where demand is high, and correspondingly reducing production in the following slack months. In addition to indicating the sufficiency of existing stocks, a table such as that above can be used to indicate the average stock investment implied by the policy of steady production. If it is decided to stabilise output and to arrange for sufficient stock to be in hand at the beginning of the period to negotiate the months where cumulative demand exceeds cumulative production, it will obviously be necessary to close the year with sufficient stock to enable the business of the following period to be handled in the same way. Plans would be made on the same basis as before for handling the required output, and periodic revisions would be made to determine the accuracy of the estimate.

Firms Manufacturing Special Equipment.

Where a firm is manufacturing special equipment against customers' orders, it is obviously impracticable to produce for stock. In such a firm the object must be to handle the order in the shortest time possible and to manufacture as much as possible in anticipation of definite customers' orders. Here again, an estimate of probable business is necessary for the purpose of enabling the factory resources to be laid out in the most convenient and efficient way to handle expected business. For this purpose the estimate of requirements should be reduced to components and a figure established for the quantity of the various types of castings, stampings, parts, &c., required during the year. On this basis the space in the factory can be allocated to the various operations in the best way to produce the required output and accommodate assembly work, allowing for unavoidable idle time.

The next step in production planning for such a concern is to analyse typical orders to determine what are the vital items so far as manufacturing time is concerned. If arrangements can be made to start work on these items and the implied sub-assemblies in advance of the receipt of an actual order, delivery periods can be shortened accordingly. The arrangements for doing this preliminary work on items that are required in the initial stages of the job, or that take an exceptionally long time to complete, will depend on the circumstances of the particular firm. In some instances the items may be so far standardised as to allow a regular production schedule to be set up covering the whole year's programme irrespective of particular jobs. Alternatively, it may be reasonably safe to start work upon submitting a tender where information is available as to the probability of the tender materialising into an order. In either case, a careful consideration of the manufacturing problem to be faced over the year, will undoubtedly indicate certain lines along which considerable progress can be made in the reduction of delivery periods.

Faults in Testing Batteries.

The effect of battery earth leaks on the accuracy of high-resistance tests is considered and the necessity of well-insulated guard plates is stressed.

By D. K. McCLEERY, B.Sc.

THE following investigation refers particularly to the so-called direct deflection method of testing high resistances, for example the insulation resistance of a length of cable. The deflection on a sensitive galvanometer produced by a battery of 100 to 200

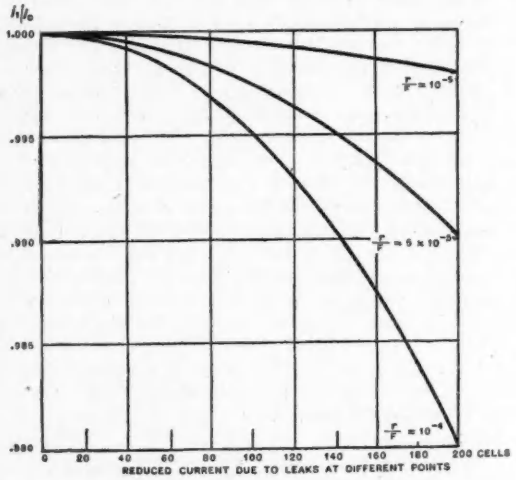


Fig. 1.—Current Reduction due to Leaks at Different Points.

cells through the high resistance is compared with the deflection given by the same battery through a standard megohm resistance, a universal shunt being used to extend the range. The effect of a leaky battery on the test is here considered.

A battery with distributed leaks to earth is assumed to be equivalent to a perfectly insulated battery having a

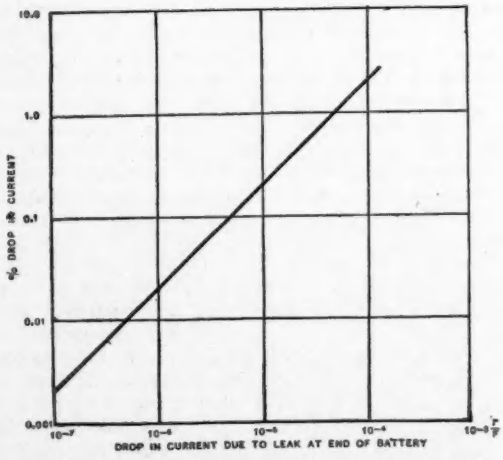


Fig. 2.—Drop in Current due to Leak at Head of Battery.

single resultant leak operating at some point of it, see fig. 4.

Here R is the high resistance under test, G the resistance of the galvanometer with its shunts, and F is the leakage resistance supposed to act at a point n cells from the tail end of the battery. Let N be the total number of cells in the system each of e.m.f. e and internal resistance r.

Fig. 5 shows that arrangement drawn as a network of two meshes, G being negligible compared with R.

Then, putting cyclic currents i_1 and i_2 in the meshes and summing the e.m.f.'s by Kirchoff's laws, we have :—

(1) $i_1 [R + F + (N - n)r] - i_2 F = (N - n)e$,

and (2) $-i_1 F + i_2 (F + nr) = ne$.

Solving, $i_1 = \dfrac{\begin{vmatrix} e(N-n) & -F \\ n & F+nr \end{vmatrix}}{\begin{vmatrix} R+F+(N-n)r & -F \\ -F & F+nr \end{vmatrix}}$

$$= \frac{e\,[NF + n\,(N-n)r]}{R\,(F+nr) + Nr\,F + n\,(N-n)r^2} \quad \ldots\ldots\ldots (3)$$

$$= \frac{e\left[N + \dfrac{rn}{F}(N-n)\right]}{R\left(1 + \dfrac{r}{F}n\right) + Nr + \dfrac{r^2}{F}n(N-n)} \quad \ldots\ldots (4)$$

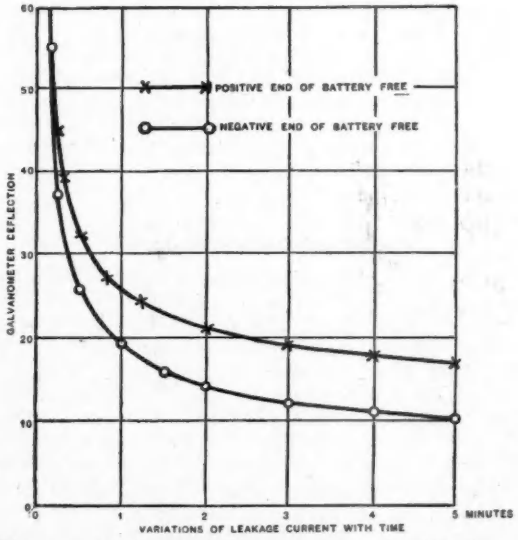

POSITIVE END OF BATTERY FREE
NEGATIVE END OF BATTERY FREE
GALVANOMETER DEFLECTION
0 10 20 30 40 50 60
0 1 2 3 4 5 MINUTES
VARIATIONS OF LEAKAGE CURRENT WITH TIME

Fig. 3.—Variation of Leakage Current with Time.

The value of $Nr + \dfrac{r^2}{F}n\,(N-n)$ is negligibly small in comparison with R; therefore—

$$i = \frac{\dfrac{eN}{R}\left\{1 + \dfrac{rn}{F}\left(1 - \dfrac{n}{N}\right)\right\}}{\left(1 + \dfrac{r}{F}n\right)} \quad \ldots\ldots\ldots (5)$$

The current with no leak is, of course, $i_0 = \dfrac{eN}{R}$ ....(6)

In equation (5) the term within the brackets is the ratio i_1/i_0; this ratio is shown in fig. 1 for values of r/F 10^{-4}, 5×10^{-5} and 10^{-5} giving the reduced current to line caused by these leaks acting at various points along a battery of 200 cells. The influence of the leak is greatest at the head end of the battery.

Fig. 2 shows the percentage fall in the current to line caused by different leaks acting at the head end of a 200 cell battery. R is here supposed to be so great that

there is no appreciable voltage drop in the battery. A variation of not more than 0.03 per cent. in the current to line will not be observed in the ordinary galvanometer test; therefore, so long as r/F is not less than about 10^{-6}, the leak will not affect the tests.

At first sight it would seem that, if the deflection of the instrument were observed through the standard megohm with an earth connection at the tail end of the battery, any error due to leakage would automatically be compensated, since the currents through the megohm and through the unknown resistance are reduced in the same ratio. But when the battery is reversed, unless the leak happens to be in the middle of the battery, the readings will in general differ. In the extreme case of the leak being at one end of the battery the percentage difference in the readings with opposite polarity is as shown in fig. 2.

Observation of the leak.—One pole of the battery is connected through the galvanometer, suitably shunted, to earth, while the other pole is free and the deflection is noted. This deflection corresponds to a current of—

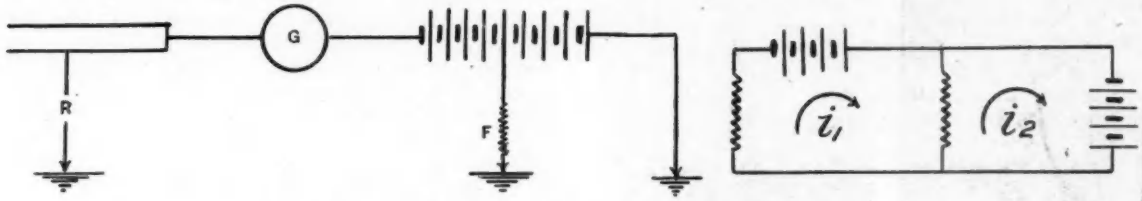
$$i = \frac{N-n}{F} e \quad \ldots\ldots(7)$$

The battery is then reversed and the current is—

$$i^1 = \frac{n}{F^1} e \quad \ldots\ldots(8)$$

The leakage resistance is written F^1 to distinguish it from the F in equation (7). If the leakage resistance were the same for either direction of current then the point in the battery at which the resultant leak acts follows immediately from equations (7) and (8), but there is little reason to suppose that this is the case. The chief point in this experiment is, therefore, to see if there is a leak and whether it is sufficiently great to have any effect on the tests.

Fig. 3 shows the results obtained by the above method on a battery of 200 Leclanché cells. The current through the leak appears to be a function of the time rather like the current through a dielectric. Whether this anomalous current is reversible or not, it does not seem possible to determine, since the leak cannot be separated from the battery.



Figs. 4 and 5.—Battery with Leaks to Earth Distributed.

It is the usual practice to place guard plates under the galvanometer and shunt box, and even under the keys, and to connect these plates to the head end of the battery with the idea of eliminating surface leakage, according to the method first suggested by Price. From the above investigation it will be seen that these guard plates must themselves be well insulated or they will introduce a battery leak at the very point where it is most desirable to avoid it. Care in securing high insulation for the battery becomes wasted when the guard plates are screwed to the testing table.

Electricity for the Home.

Somes notes on the development of domestic electricity supply in the West Riding of Yorkshire.

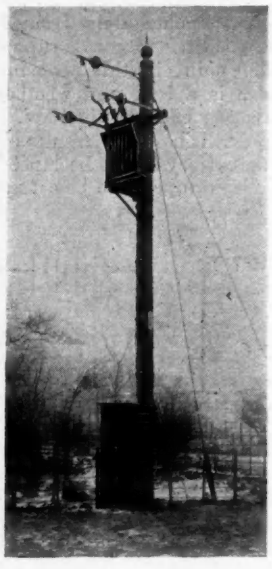
THE industrial area of the West Riding of Yorkshire is situated in and around a rectangle of which the four corners are Leeds, Doncaster, Sheffield, and Halifax. Taken as a whole this area is densely populated and highly industrialised, and is an excellent field for electrical development. Some ten of the larger towns in the area are, however, separately supplied with their own generating stations and distributing systems. The remainder of the area, together with the outlying parts of the Riding and portions of Derbyshire, Nottinghamshire, Lincolnshire, and the East Riding, constitute the area which is being developed electrically by the Yorkshire Electric Power Co. and its associated company, Electrical Distribution of Yorkshire, Ltd., the former dealing with bulk supplies and large power users, and the latter catering mainly for small users and the domestic load.

These notes deal with the Distribution Co.'s activities. The company now holds 41 orders for a total area of 1,197 sq. miles, which includes one municipal borough, 72 urban districts, and the whole or part of 20 rural districts. The total population of the area is 751,000. In spite of the scattered nature of the area the company's progress has been rapid and extensive. For the past three years new consumers have been connected at the rate of over 7,000 a year, bringing the total up to 36,000. The sale of electricity has increased as follows:—

Year.	kWh Sold.
1926	6,944,450
1927	9,697,191
1928	13,464,391
1929	18,020,408

The company recommends domestic consumers to adopt the residential tariff, which embodies a fixed charge at the rate of 3s. per room per quarter, and in addition a charge of 1d. per kWh consumed for the first 50 kWh per room per quarter, and ¾d. for each additional kWh. The term "room" includes all living rooms, but not halls, cellars, bathrooms, &c. For example, for an ordinary parlour-type house containing a sitting-room, kitchen, scullery and three bedrooms, the fixed charge is 18s. per quarter, and the kWh rate 1d. per kWh for the first 300 kWh per quarter and ¾d. for each additional kWh in that quarter. This tariff is also applied to shops and business premises; in such cases each 100 sq. ft. of floor area counts as a room. For those who still prefer to have lighting and heating metered separately, there is an alternative tariff in which the lighting rate is 5½d. per kWh, and the heating rate 1½d. per kWh for the first 150 kWh per quarter and 1d. for each additional kWh. It is interesting to note

that the same tariffs serve for both the consumers in the towns and those in the rural areas.

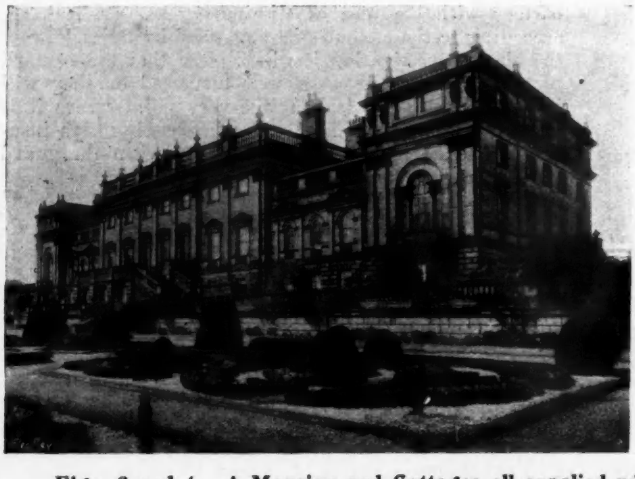


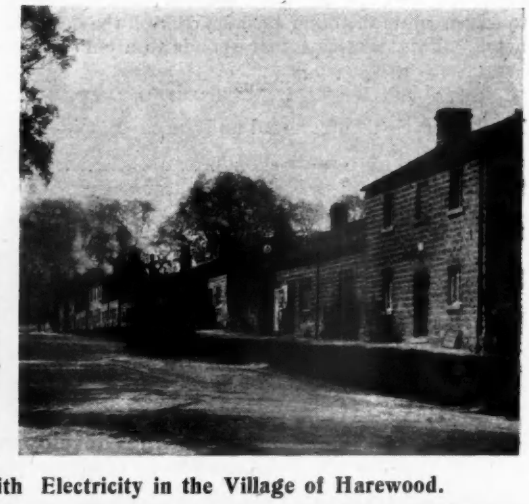
Figs. 1 and 2.—Examples of Rural Distribution Work in the West Riding.

The company undertakes its own installation and maintenance work. It is found that the country folk are generally quite keen to take electricity supply for domestic purposes, and cookers, for instance, are being sent out to the rural districts at the rate of about 30 per month. Figs. 1 and 2 depict examples of the company's overhead rural distribution work. Knowledge of the above and other appliances is propagated by means of local exhibitions. For the purpose of such an exhibition a suitable hall is usually taken for a week, and invitations and handbills are distributed in advance, the exhibition being accompanied by a canvassing campaign in the district selected. Various manufacturers co-operate in the display of electrical apparatus at these exhibitions, and demonstrations of electric cooking and washing are given. Fig. 5 shows a part of the company's display at the last local exhibition held at Queensbury. The company has offices and showrooms at eight centres, in addition to the head office at Leeds.

The importance of encouraging the teaching of electrical methods in schools and domestic science centres is recognised, and in this connection it is pleasing to record that arrangements have recently been made for equipping electrically three large secondary schools for the West Riding County Council.

Many housing estates, and in some cases whole villages, are lighted throughout by electricity. An interesting example of the latter is Harewood, where every one of the 112 houses in the village uses electricity, from Harewood House, fig. 3, the residence of Princess Mary, to the smallest cottage, fig. 4.





Figs. 3 and 4.—A Mansion and Cottages all supplied with Electricity in the Village of Harewood.

The proportion of consumers on the residential tariff is increasing rapidly, and the increase is an indication of the growing demand for domestic electricity.

The price of gas in the company's area varies from as low as 2s. 6d. to 6s. per 1,000 cu. ft. From the point of view of cost, therefore, it will be seen that competition in this quarter is a varying factor. The company's assisted-wiring scheme has proved very popular. Under this scheme there is no initial payment; the consumer pays twenty quarterly instalments of 1s. 3d. per light, and has the option of the ordinary tariffs.

Considerable interest is also taken in the facilities offered for the hire and hire-purchase of domestic apparatus. Appliances available on hire include "Jackson" cookers, "Jackson" and "Burco" wash boilers, and "Inventum" and "Ferranti" water heaters. The hire charges for cookers vary from 5s. 6d. per quarter for "Junior" models (1—3 persons) to 16s. per quarter for table models (10—12 persons). During the last two years something like 550 cookers, 93 wash boilers, and 16 water heaters were sent out on hire.

Fig. 5.—Display by E.D.Y. at Queensbury Exhibition.

Reviews.

The Practice of Electrical Wiring. By DONALD SMEATON MUNRO. Pp. xi+298; illustrated. London: Electrical Review, Ltd. Price 4s. 6d. net.

The new edition of this book is in its general design similar to the earlier editions, but it has evidently been completely revised to bring it up to date. The main alteration is in the addition of a chapter on Architecture and Installation, and the need for special reference to this phase of the wireman's work is easily understood when the extent of the electrical work in a large modern building is considered. Mr. Munro rightly emphasises the desirability of making ample provision, right from the earliest stages of the building design, of suitable cable ducts and other means of allowing the wiring to be carried out without extensive later disturbance of the actual structure. Every practical man will have had painful experience of trying to carry tubing across floors with a totally inadequate thickness of cover on the concrete, and of trying to conceal tubes in a 2-in. tile partition, and will second Mr. Munro's desire that such things should have been foreseen and avoided.

The book is limited by its title to the practical side of wiring, and all references to theory are excluded. This is in some ways regrettable, but it gives Mr. Munro more opportunity for dealing with his actual subject without enlarging the book to an unwieldy size. It is no doubt for the same reason that many other aspects of the wireman's work are not considered, as there are no references at all to motor wiring, bells, telephones, or other aspects of wiring work.

The various wiring systems are all carefully dealt with. Perhaps the only criticism that might be made is that Mr. Munro is unduly sceptical as to the suitability of lead-sheathed systems for many purposes. The extent to which these systems are in use to-day rather indicates that the majority of electrical firms do not altogether agree with his views.

On the question of earthing Mr. Munro is very decided; he does not even consider the subject of an all-insulated installation. He devotes considerable space to instructions as to the need of ensuring an effective earth and of how to meet this need. In taking this view he is probably in agreement with the large majority of electrical men.

The book is a very sound piece of practical writing on the subject of electrical wiring, and evidently embodies the experience of many years and of much careful thought on the why and wherefore of how to do it and how not to do it.

Industrial Electricity and Wiring. By J. A. MOYER and J. F. WOSTREL. Pp. x+469; figs. 281. London: McGraw-Hill Publishing Co., Ltd. Price, 13s. 9d. net.

The joint authors of this book are connected with the University Extension of the Massachusetts Department of Education, and it has been written primarily for the guidance of American students. It is interesting to note how, in the preface, the historical development of electricity has its chief landmarks in the U.S.A. The beginning of industrial electricity, it would appear, was Elihu Thomson's motor shown at an exposition at Philadelphia in 1876, and Edison is credited with the invention of the electric light in 1879.

The first chapter on "Fundamental Theory and Units" is clear and comprehensive, but in one of the diagrams illustrating the measurement of energy a lamp is shown, while the text refers to an electric iron. Having noted, therefore, that the authors are not above making a little slip the British reader fully regains all the *amour-propre* which he may have lost in the preface.

We are reminded in this book that even in the United States apprenticeship in the year 1930 is recognised as the proper preliminary of a qualified wireman, and in many States it is in addition obligatory to pass an examination and obtain a licence before engaging in electrical installation work.

Although fundamental principles and many practices must be similar on both sides of the Atlantic, the book shows how remarkably different from our own are the methods and materials of wiring in America.

The National Electric Code has got far more real authority than our I.E.E. Wiring Regulations, an effect which has been attained by the fact that fire insurance in America can only be obtained on a building if the electrical work conforms with the Code. This text-book takes the recently revised National Electric Code and very completely explains and amplifies its provisions. Thorough understanding of the Code is most necessary, as all work is examined and tested in its terms by authorised inspectors for the insurance companies. One gathers from the text that the amount of open wiring originally so popular, owing to wood construction and low voltage, is now small compared with conduit and armoured-cable installations, and the authors give many practical hints in the treatment and applications of the various wiring systems. A useful chapter deals with the "Grounding of Systems and Equipment" and shows that "over there" also the question of continuity of earthed sheath has become of primary importance. The chapters on circuit arrangements and their control are very complete and every chapter in the book is followed by a set of test questions which are well framed to fix the essentials in the memory. There is a 15-page index. The book is a thorough exposition of American wiring practice, and though its terms and references to circular mils, panels, tinsel, slow burning insulation, Duplex, &c., and a wage rate of seven dollars per day may be somewhat confusing to the average British wireman, the book is certainly one to be read and consulted by the serious student of installation work.

D.S.M.

Principles of Electrical Engineering. By W. H. TIMBIE, Professor of Electrical Engineering in the Massachusetts Institute of Technology, and V. BUSH, Professor of Electric Power Transmission in the Massachusetts Institute of Technology. Pp. vii+595; figs. 270. London: Chapman and Hall, Ltd. Price 22s. 6d.

The volume under notice is the second and revised edition of a book which first appeared in 1922, and is concerned with an account of the fundamental principles of electrical engineering, rather than with the application of those principles to particular machines. Further, the principles described are those more directly associated with direct currents, comparatively small attention being paid to the special problems arising in alternating current working. The scope of the new edition is very similar to that of the first edition, perhaps the most noteworthy change being in regard to the examples which are included in connection with each chapter. These have been increased in number and are excellent both in standard and variety, though it would be advantageous if answers were added. In the case of the examples attached to Chapter 1, it would have been better to have inserted them somewhat later in the book, since, for the most part, the ideas, formulæ and facts needed for their solution do not appear in the chapter to which they are attached.

As might be expected in view of the origin of the book, certain terms are used which sound unfamiliar to English ears, and the reviewer has been particularly interested concerning the meaning which should be attached to the unit referred to as the "long ton" on page 15. The use of the prefix "ab" in association with the name of the practical unit of a quantity when reference is made to the corresponding absolute unit (as abampere or abvolt) appears to be neat and concise and is perhaps worthy of more general adoption.

The matter in the book is treated in a careful, exact and interesting manner, and perhaps the only portion which appears to call for some criticism is that dealing with the units of such quantities as current, voltage, power and work. In this matter it would seem that insufficient stress is laid on the logical connections of these units with each other. Further, the numerical relationships between certain mechanical and electrical units of power and work are simply stated, and again it would appear to be well worth while to indicate the origin of the relationships mentioned.

On the other hand special commendation can be given to the treatment of such subjects as Kirchoff's Laws, magnetic work and dielectrics. The book can be heartily recommended to students of electrical engineering and to practising engineers who desire to obtain sound ideas concerning the scientific aspect of their work.

Design of Electrical Apparatus. By JOHN H. KUHLMANN. Pp. xii+455; figs. 246. London: Chapman & Hall, Ltd. Price 30s. net.

This book deals with the design of electric machines and transformers. The author, previously a designer of electrical apparatus, is now Assistant Professor of Electrical Design in the University of Minnesota, U.S.A. As is to be expected, therefore, the procedure and methods employed are those of the professional designer, though this remark must not be taken to imply that any two design offices follow entirely the same routine. There is, however, a general resemblance between the design-office methods of most electrical works, and this book may be said to follow more or less standard lines. We have noticed nothing sufficiently striking to call for special comment, though, of course, we would not expect any professional designer to admit the superiority of any method not employed by himself.

The method of treatment adopted by the author for each type of apparatus discussed is, first, to explain the construction of the apparatus to be designed; second, to explain the formulæ and procedure; third, to give the design limits established by practice; and fourth, to illustrate with complete sample calculations. Such calculations are given for a 300-kW, d.c. generator; a 15-h.p. shunt motor; a 2,500-kVA waterwheel-type alternator; a 200-h.p., self-starting synchronous motor; a 15-h.p., 1,200-r.p.m. cage-type induction motor; a 400-h.p., 514-r.p.m., slip-ring type induction motor; a 400-kVA, 1-phase, core-type transformer; a 1,000-kVA, 3-phase, core-type transformer; a 10-kVA, 1-phase transformer with 4-part distributed core; and a 500-kVA, 1-phase, shell-type transformer. Some of the designs extend over various chapters; others are carried out separately; but in each case a complete data sheet is drawn up.

There is much useful information in this book. It is not only suitable for students taking an engineering course, but designers will find it worthy of careful perusal on account of the gleanings obtainable therefrom. The appendix contains the necessary data on copper sizes, magnetisation and loss curves, and this is duplicated on a separate loose leaflet for handy reference.

Radio Data Charts. By R. T. BEATTY, M.A., B.E., D.Sc. Pp. 82. London: Iliffe & Sons, Ltd. Price 4s. 6d. net.

The design of apparatus used in wireless receivers presents many rather tedious calculations, and these charts, in the form of abaci, reduce to comparative simplicity the work involved. Information on the subject matter of each chart is given on the page facing the chart. The charts themselves and this letterpress which accompanies them appear to be exactly what is required, and we recommend the book to those who wish to design receiving apparatus. The charts cover not only the more familiar problems, but the more difficult ones, such as the estimation of stage gain with different couplings and the design of high-frequency transformers.

This set of charts was originally published as a series in the *Wireless World*, and has been revised and amplified for publication in book form. The book should prove very useful, not only to the serious amateur experimenter for whom the charts were primarily intended, but also to the professional wireless engineer.

Pioneers of Electrical Communication. By ROLLO APPLEYARD. Pp. ix+347. London: Macmillan & Co., Ltd. Price 21s. net.

In this book Mr. Rollo Appleyard has given biographical and critical memoirs of Maxwell, Ampère, Volta, Wheatstone, Hertz, Oersted, Ohm, Heaviside, Chappe, and Ronalds. Though necessariy brief, there is an air of completeness about each memoir. The author has not been content to absorb and summarise all that has been written by, or of, his pioneers, but has apparently visited the scenes of their labours, and when they help to an understanding of their work has made references to the political and social conditions of their times. Wheatstone's original models are assembled to illustrate his discoveries; Hertz's lecture table is "reconstituted"; the struggles of Ampère are the more readily comprehended by the details and illustrations of the scenes of his early life; the financial hardships of Chappe in the construction of his chain of semaphores are clearly realised. In each an "atmosphere" is created which increases the reader's interest. At the same time the scientific contributions of each pioneer—whether mathematical or physical—are clearly and fully stated. As an illustration of the author's care for accuracy we may quote the following:—"It is unfortunate that a philosopher (Ohm) who devoted his life to precision should have inaccuracy stamped upon what is alleged to be his house and an erroneous date engraved upon his tombstone." Of these pioneers the nearest to our own times has been the least known. We believe that Mr. Appleyard's memoir is the first biographical and critical account of Heaviside and his work. "His mode of working and his attitude of mind" are considered by the author, which helps us to some extent to understand the much misunderstood, but increases our regrets that the world's recognition of Heaviside's work was delayed until "an attitude of mind" had become so far set as to make a mutual understanding and appreciation impossible. Well illustrated and well indexed, this is a book which will appeal to all interested in scientific progress, and especially to that now numerous body directly or indirectly concerned in the art of electrical communication.

A Coal Survey Report.

The Department of Scientific and Industrial Research has just published Physical and Chemical Survey of the National Coal Resources No. 15, "A Survey of Scottish Coking and Furnace Coals" (H.M. Stationery Office, price 4s. net). The Survey Papers of the Fuel Research Division form a series of special publications on matters connected with the physical and chemical survey of the coal seams of Great Britain, which has for its object the collection of data necessary for the most advantageous use of the national coal resources. The work with which this report deals was initiated by the Scottish Advisory Committee on Iron and Steel Production appointed by the Ministry of Munitions of War in 1916 to inquire into the quantities of coking and blast-furnace coal in Scotland. The information was at that time confidential, but in response to numerous requests it is now published. The samples dealt with were received in response to a circular letter addressed to the coalowners; numbering over 360, they are believed to include the great majority of coking and furnace coals mined in Scotland. The physical properties of each sample and of both the laboratory and the practical test cokes made therefrom are briefly described. A proximate analysis of each sample and, in the majority of cases, sulphur and phosphorus figures for the coal and coke appear in tabular form. In the introductory section details are given of the methods of examination, including the method of phosphorus determination and of the testing of coking properties in coke ovens under practical conditions.

Legal.

Cork Electric Supply Co., Ltd., v. Concannon and the British Thomson-Houston Co., Ltd.

THIS action came before Mr. Justice Johnston in the Dublin High Court on June 4th. The plaintiffs asked for rulings on certain questions relating to the construction of their memorandum and articles of association. These questions were whether the preference shareholders were entitled to participate rateably or at all with the ordinary shareholders in the surplus assets in the event of liquidation; and whether the company had power to capitalise whole or part of the money received in excess of the book value of the assets upon the acquisition of the company's electric lighting undertaking by the Free State Electricity Supply Board, and if so, whether the preference shareholders were entitled to participate rateably or at all in the distribution of that capitalised surplus. Mr. E. G. Concannon represented the preference shareholders and the British Thomson-Houston Co., Ltd., the ordinary shareholders.

For the plaintiff company Mr. FITZGIBBON, K.C., outlined the company's history up to the sale of its lighting undertaking to the Electricity Supply Board and said that it was in the position of a company that had sold an estate to an independent body and was ascertaining what should be done with the proceeds of the sale.

When the hearing was resumed on the following day, Mr. FITZGIBBON said that the total capital of the company was £175,000, and debentures for £91,600 had been issued. The value of the undertaking, arrived at by agreement, was £496,000, and that was the basic sum which the Board would pay the company. Counsel submitted that the principles governing the winding-up of the company could be applied to this case.

Mr. J. M. FITZGERALD, K.C., on behalf of the preference shareholders, said that the value of the surplus assets could not be determined satisfactorily until there was an actual winding up. The plaintiffs were really carrying on an interim distribution while ignoring the preference shareholders. The preference shareholders, he maintained, were entitled to a sum of £70,000, and they had not been consulted in the framing of the questions before the Court.

Mr. FITZGIBBON replied that the questions had been placed before a meeting of the two classes of shareholders.

Mr. E. LAVERY, K.C., for the ordinary shareholders, claimed that there was nothing in the company's memorandum and articles conferring upon the preference shareholders equal rights with the ordinary shareholders in the distribution of surplus assets. They were merely entitled to their fixed dividend and priority in repayment of their capital.

Mr. Justice JOHNSTON reserved judgment.

Sligo Lighting & Electric Power Co.

THE *Irish Times* reports that in Dublin on June 2nd Mr. Justice Johnston heard an application on behalf of this company for the payment to it of moneys lodged in Court as a deposit to secure the performance of the company's undertaking.

Mr. LEONARD, K.C., said that the company was originally a gas company, but in 1924 it obtained a private Act conferring upon it electricity supply powers. It was given two years in which to erect a power station and lay mains, but the Ministry asked it to delay the commencement of the works until the Electricity Commissioners had expressed their views. Later on the Electricity Commissioners said, in effect, that as the works had not been begun they would have nothing to do with the company. Nothing had been done and no land had been taken, consequently nobody had been injured. The company had lodged in Court £1,132 in the form of Land Bonds.

His LORDSHIP said that he would not make any order without public notice. He would therefore order that public notice should be given of the hearing of the summons which would be adjourned until next term.

The Responsibilities of Contractors.

THE Brighton magistrates on June 7th delivered their judgment in the recently-reported action in which Mr. H. J. Galliers, electrical contractor (a former mayor of the borough), was summoned for failing to provide a guard-rail and toe-board for the protection of his workmen on a building in Brighton (*vide* ELEC. REV., May 30th, p. 1025). The governing point, according to the decision of the Bench, was whether on the date of the summons the building in question was a "factory" within the meaning of Section 105 of the Factories and Workshops Act. The machinery on the premises was removed on March 11th, which was about a week before the accident took place, and the premises then ceased to be a factory within the meaning of the Act. The summons therefore failed and the action was dismissed. The Bench allowed Mr. Galliers ten guineas costs.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures.

German Competition with French Works.

Speaking at the annual meeting of the Compagnie Générale d'Electricité, the chairman is reported to have given expression to his apprehensions concerning the competition of the German electrical industry with that of France. He stated that the danger had increased through the participation of the Americans in the German electrical industry. When for any reasons the sales of American electrical products became impossible, France would meet with German competition which would be financially supported by the Americans. This circumstance must give a new incentive to concentration and rationalisation in France in order to be able to reduce the costs of production and increase wages. This would contribute towards improved consumption and consequently to the development of the home market.

Copper Prices: A French Protest.

The Chambre Syndicale des Metaux recently sent a telegram on behalf of itself and five other bodies to the Anaconda Copper Co. in New York as follows:—"Representatives of copper consumers in Germany, England, Austria, Belgium, France, Italy, and Switzerland, at a meeting in Paris unite in protesting against the manner of procedure of American holders of copper, who, at a time when stocks are known to be large, decline to give satisfaction to the demands for raw material supplies addressed to them. They protest also against the violent fluctuations in the prices of copper which greatly disturb the market."

In reply to this, Mr. Kelley, of the Anaconda Co., stated that they could not compel copper manufacturers to sell more than the demand for consumption at current prices. Consumers themselves were responsible for the position in the early months of 1929, and if the same condition of things persisted this year consumers would still be responsible. They delayed too long in purchasing the quantity required for their needs and came on to the market to make sudden purchases.

Conditions in Poland.

The Department of Overseas Trade has published (through the Stationery Office, 1s. 6d. net) a report on economic conditions in Poland during 1929 by Mr. R. E. Kimens, C.M.G., Commercial Secretary at Warsaw. In this it is shown that Poland was affected adversely by world financial and economic depression during the year, especially as regarded its agricultural industry upon which 65 per cent. of the population depends. During 1929 both exports and imports decreased in value, but the unfavourable balance was substantially reduced. It is considered that the United Kingdom has not taken full advantage of the possibilities of the market. Mr. Kimens repeats the usual complaints against British producers—that their goods are high-priced and not adapted to the market; that their credit terms are less favourable than those of their competitors; that they are inadequately represented in Poland; and that they do not employ the right languages (French and German) in their correspondence. It is stated that the influx of foreign capital into Polish industry made further, but slower progress in 1929, and spread to additional industries including the engineering and electrical branches. The openings for British enterprise in connection with public works have diminished for the present, but the position should change with the improvement of the financial situation, as the needs of the country in respect of public utilities, railways, tramways, electric power plants, &c., remain as great as before. Mention is made of the placing of an important contract for broadcasting plant with a British company. It covers the construction of a 120-kW station at Radom, a 16-kW station at Lwow, and three relay stations at Lodz, Torun and Warsaw. The existing 16-kW station at Warsaw is to be re-erected at Wilno. The work is expected to be completed this year. An appendix to the report shows that Poland's imports of "apparatus, conductors and other electro-technical materials" during 1929 were valued at 96,666,000 zlote (£2,227,000), while exports of this class had a value of 1,644,000 zl. (£38,000).

Trade with Brazil.

In the course of its annual review for 1929, the British Chamber of Commerce in Brazil says that British machinery continues to maintain the excellent reputation which it has always enjoyed in Brazil. The market, however, is more competitive than before the war and low prices are of increasing importance in the securing of business. The difference between American and British methods in the machinery business is very marked. The former spend money in advertising in Portuguese, and in many instances place their machines in Brazil, delivered and mounted ready for work, with duties paid and price in Brazilian currency, for long-term payment. The latter, on the other hand, do not advertise, send catalogues in English, which are only understood by a limited number of Brazilians, and expect the customer to purchase machinery from catalogues on a c.i.f. basis, "cash against documents London" being demanded. While British reputation enables the manufacturer to obtain a small amount of business on these terms, the facilities offered by other nations will eventually outweigh the preference now given the British manufacturer on the ground of quality. "It would seem, in Brazil at any rate, that British manufacturers have the idea that it is sufficient to offer a sales agent 5 per cent. net commission on business actually taken by him, leaving the agent to pay advertising and all other expenses, and are dissatisfied when they do not obtain business on these terms. It is obviously quite impossible for agents to continue in business year after year if they are only paid commission on business placed through them. Expenses are heavy, commission small, and one bad year will wipe out any small reserves built up in five years trading. If it were possible for a certain number of non-competing firms to combine and make arrangements for a joint selling organisation at this end it would form a more economic method of doing business and would allow of a much more efficient propaganda campaign being carried out."

India.

At the informal monthly luncheon meeting of the British Engineers' Association yesterday (Thursday), Sir Ernest W. Petter, chairman of Petters, Ltd., was to speak on "Some Recent Impressions of India."

Poland Rejects American Electricity Scheme.

The Warsaw correspondent of *The Times* reports that the Polish Government has rejected the proposal made last year by Mr. W. A. Harriman concerning the electrification of six provinces of Central Poland, covering an area of approximately 40,000 sq. miles. Mr. Harriman proposed to build a series of power stations and transmission lines, using both fuel and water power. In return for this construction a 60-years' concession for the distribution of electric power was to be granted to him. He was to invest at least $25,000,000 (£5,000,000) during the first 10 years of operation in Poland. The proposal was published a year ago in the official *Gazette*, and all concerned were invited to present objections within three months. A Press campaign against the proposal was begun immediately after the announcement.

The Marking of Imported Electric Lamps.

The Board of Trade announces that in pursuance of the powers conferred upon it by Section 3 of the Merchandise Marks Act, 1926, it has directed that electric incandescent lamps of ornamental design which, on account of their uneven surface, cannot be marked on the bulb as prescribed by the Merchandise Marks (Imported Goods) No. 2 Order, 1928, may bear an indication of origin indelibly stamped, embossed, incised or impressed on the cap. The Board has referred to the Standing Committee under the Act for consideration the question whether the relevant Orders in Council should be amended, and representatives of any interests substantially affected who desire to be heard at the public inquiries which will be held later by the Committee should communicate with the secretary, Mr. E. W. Reardon, Board of Trade Offices, Great George Street, S.W.1, not later than June 30th.

Unemployment.

The Ministry of Labour returns record an increase of 10,640 in the number of registered unemployed during the week ended May 26th. At that date the total was 1,770,100, as compared with 1,759,460 on May 19th, and 1,132,281 on May 27th, 1929.

The Standard Telephones Pension Scheme.

For a number of years Standard Telephones & Cables, Ltd., has had a non-contributory pension scheme in operation, but its scope and scale of benefits have recently been considerably enlarged. Every employé of the company, including the hourly-paid workers, comes within its provisions. Pensions are based on the employé's average annual earnings over his whole period of service, and amount to 1½ per cent. of this average, multiplied by the number of years during which the employé has served. An employé, at the discretion of the company, may be retired on pension when he reaches the age of 60. He may himself elect to retire on pension at the age of 65 if he wishes to, but retirement is compulsory at the age of 70. Payments are made to employés incapacitated through sickness, or any cause other than an accident met with during employment. Any employé who is rendered unfit for work through an accident arising out of his employment, receives benefit so long as he is incapacited, together with medical, surgical and other treatment. Upon the death of an employe with two or more years' service, a lump sum is paid to his dependents. In the case of an employé with ten or more years' service, a monthly pension is paid in addition to his dependents for a period not exceeding one-third of his service. In addition to the non-contributory pension and benefit plan outlined above, the company has a group life insurance scheme in operation, which permits employés to insure their lives for approximately the amount of their annual earnings, at a very low rate.

Irish Free State Electrical Imports.

The Irish Free State Ministry of Industry and Commerce has issued detailed figures of imports during the last year comparing them with 1928. From these we have compiled the appended table showing the value of the total imports of electrical machinery and cognate material into the Free State, and the amount attributed to the United Kingdom as country of shipment, but not necessarily of manufacture:—

	Total Imports.		U.K. share.	
	1928.	1929.	1928.	1929.
	£	£	£	£
Electric wires and cables	224,745	198,850	78,855	81,695
Telegraph and telephone apparatus ...	10,299	30,840	8,599	29,186
Electric lamps and parts	83,139	93,024	39,155	58,595
Batteries and accumulators	30,710	28,204	27,972	23,341
Radio sets and parts ...	84,431	93,115	82,915	91,549
Other electrical goods and apparatus ...	119,675	171,657	65,989	136,545
Generators	17,793	67,207	10,991	12,876
Motors	29,979	30,980	21,208	26,088
Other electrical machinery	135,182	215,014	57,983	103,250
Totals ...	£735,953	£928,891	£393,667	£563,125

As will be seen, of the total imports £563,125, or approximately 60 per cent., came from ports of the United Kingdom as against about 53 per cent. in 1928. The foreign imports consisted largely of wires and cables, and electrical machinery, of which the bulk is credited to Germany.

Showroom Extension at Chester.

The Chester City Council has accepted a contract for alterations to the electricity showrooms for the sum of £3,980, and has applied for sanction to a loan of £5,000 to meet the cost and incidental expenses.

Recent Contracts.

The ENGLISH ELECTRIC CO., LTD., has received two more important orders for electric trolley buses from Bradford Corporation and from Messrs. Balfour, Beatty & Co. for the Nottinghamshire & Derbyshire Traction Co. The order from Bradford is for 12 double-deck, top-covered vehicles, each having a seating capacity for 56 passengers. The chassis will be of the "English Electric" low-loading, three-axle type with air-operated brakes on all wheels, rheostatic braking also being included. The equipment will consist of a D.K.122, 110-h.p. twin-type motor, fitted with roller bearings and "English Electric" contactor-type, foot-operated controller. Bradford Corporation now has 52 "English Electric" trolley 'buses. The order from Messrs. Balfour Beatty is for six single-deck, saloon-type "English Electric" trolley 'buses, each having a seating capacity for 32 passengers, mounted on "English Electric" two-axle type chassis, with air-operated brakes on all four wheels and a system of rheostatic brakes. The electrical equipment will consist of a D.K.121, 60-h.p. motor, fitted with roller bearings and "English Electric" contactor-type, foot-operated controller.

The Central Picture House, Redcar, which was opened on May 26th, has an installation of emergency lighting equipment, which automatically takes over the load in the event of a mains failure. The battery was supplied by the PREMIER ACCUMULATOR CO. (proprietors, Pritchett & Gold and E.P.S., Co., Ltd.), 50, Grosvenor Gardens, S.W.1, being one of 27 "RWNX7" type cells, of the closed top pattern.

Messrs. JOHN SPENCER, LTD., Wednesbury, recently received a contract for the supply, delivery, and erection of the high-pressure steam and feed piping for the new power station of the Liverpool Corporation at Clarence Dock. The pipework for the station, which will eventually operate at 450 lb. per sq. in., superheated to 825 deg. F., is to be fitted with the "Spencer" patent joint designed by Sir T. Harris Spencer, managing director of the company.

Scottish Electrical Contractors.

At the business meeting of the Electrical Contractors' Association of Scotland, held during the recent anual meeting and conference at Taymouth Castle, Perthshire, the following office bearers were elected for the ensuing year: President, Mr. D. H. Morris, Dundee; vice-president, Mr. Henry Meighan, Glasgow; and secretary, Mr. Walter Finlay, W.S., with a board of 16 members. The conference papers included: "The Extension of the Organisation of the Association," by Mr. Morris, the new president; "The Improvement of Installation Work and its Specification," by Mr. Johnston, F.O.G.G.O., past president; and "The Scheme for the Registration of Electrical Contractors," by Mr. Alex. Lindsay, Glasgow, another past president. While at Taymouth the members engaged in the usual East *v.* West golf match, and on this occasion the eastern representatives won the trophy. One of the trips provided was a motor run round Loch Rannoch, with a visit to the new power station on the shores of the lake.

Australian Trade Commissioner's Visit.

The Department of Overseas Trade announces that Mr. H. L. Setchell, Trade Commissioner at Melbourne, is now in this country on an official visit. He will be available at the offices of the Department from June 16th to 23rd, to interview manufacturers and merchants interested in the export of British goods to the States of Victoria and South Australia. He will later visit a number of industrial centres in the provinces. Firms desiring interviews with Mr. Setchell in London, or information regarding his arrangements to visit provincial centres, should apply to the Comptroller-General of the D.O.T., 35, Old Queen Street, S.W.1 (reference 13416/1/30).

Book Notices.

The June number of "On Guard," the little monthly magazine issued by the National "Safety First" Association, 119, Victoria Street, S.W.1, deals particularly with falls, their cause and prevention, the subject being introduced by Sir Gerald Bellhouse, Chief Inspector of Factories. Sir Arthur Stanley writes on "Road Manners" and Sir Arbuthnot Lane on "Food."

"Radio," Vol. I, No. 1. June, 1930. Pp. 16, illustrated. London: Marconiphone Co., Ltd. Price 1d.—This bright new monthly magazine is almost entirely pictorial, and is intended to appeal to all listeners. Designed to popularise radio in general and Marconiphone apparatus in particular, it is published for the company, and is distributed *only* through dealers in the company's products.

A classified catalogue of scientific and technical books published by Ernest Benn, Ltd., Bouverie House, Fleet Street, E.C.4, has recently been issued. The list covers a large variety of subjects and contains sections relating to books on electrical engineering, telegraphy, telephony, and wireless.

"A Handbook of Physics Measurements," by E. S. Ferry. Vol. II. Pp. xi+277; figs. 143. London: Chapman & Hall, Ltd. Price, 12s. 6d. net.

"The Electrical Heating and Ventilation of Bourne and Hollingsworth's Premises, Oxford Street," by A. H. Barker, B.Sc.—A reprint of a paper read before the Institution of Civil Engineers, with an abstract of the discussion thereon. Published by the Institution.

"Publications of the U.S.A. Bureau of Standards. Standards Year Book, 1930." Price 75 cents.—This fourth edition contains outlines of the activities and accomplishments of the Bureau of Standards and other agencies of the Federal Government and the States and municipalities, and also of technical societies and trade associations.

"Alternating Current Bridge Methods," by B. Hagree, D.Sc. (Lond.). Second edition. Pp. xvi+391; figs. 112. London: Sir I. Pitman & Sons, Ltd. Price, 15s. net.

"Electric Testing Simplified," by N. H. U. Cross. Pp. xv+191; figs. 103. London: Crosby Lockwood & Son. Price, 5s. net.

For Sale.

The Cark and District Electricity Co. has for disposal oil engines, generators, balancers, motors, switchboard, &c.

The Salford Electricity Department has a 23-b.h.p. "National" engine and generator for disposal.

Epsom Urban District Council invites offers for the sale and removal of two Lancashire boilers at its generating station.

(See our advertisement pages to-day.)

Trade Announcements.

The Publicity Bureau of the METROPOLITAN-VICKERS ELECTRICAL CO., LTD., has been removed to 28, Kennedy Street, Manchester (telephone: City 9100).

Messrs. J. STONE & Co., LTD., Deptford, S.E.14, have taken over the selling and manufacturing rights in the British Empire (with the exception of Canada) of the "P.I.V." chain gears, as from June 2nd.

New premises, stores, and showroom are being opened at 36, King Street, Blackburn, on June 16th, by Messrs. PALMER, RILEY & Co., LTD., Accrington, for the wholesale distribution of electrical and radio apparatus. Manufacturers' lists, &c., should be sent to Abbey Street, Accrington.

The address of Messrs. SKIPWITH, GRIST & Co., electrical and mechanical engineers, is now 40, Borough High Street, S.E.1.

The South African Electric Lamp Association.

The electrical exhibition held during the period of the Municipal Electrical Engineers' Convention at Bloemfontein last September has borne good fruit. It proved so great an attraction to the citizens of Bloemfontein, electrical contractors and visitors to the conference, that it was decided to hold similar exhibitions in Johannesburg and Pretoria this year. Now there has been formed at Pretoria the S.A.E.L.A. (South African Electric Lamp Association) with an up-to-date Lighting Service Bureau. This comprises a fine suite of demonstration rooms where practically everything likely to be of service to those interested electrically has been installed—the fullest data on every phase of electrical development being as readily available as it is here in our own Lighting Service Bureau in London. We reproduce herewith a view of the lecture theatre which, as will be seen, has a model shop-window at one end for the demonstration of different lighting methods. From the ceiling examples of industrial and commercial fittings are suspended and round the walls are floodlighting units and apparatus for demonstrating various phases of the lighting art. As in the London Bureau, there is a suite of domestic apartments with appropriate lighting; our other illustration shows the bedroom.

A Model Bedroom.

The Lecture Theatre.

A South African Lighting Service Bureau.

Bankruptcy Proceedings.

M. A. MULLER, electrical dealer, 17, Duncan Terrace, Islington, and Fairholt Road, Stoke Newington.—The public examination of this debtor was held on June 6th at the London Bankruptcy Court. The debtor filed his petition on March 10th and returns total liabilities of £6,723 (unsecured £6,600), and assets of £65. Replying to the Official Receiver debtor said he came to this country from Germany in 1922 and three years later, with £500 savings and a loan of £2,000, he began business as an importer and merchant, dealing chiefly in electrical goods. The debtor attributed his failure to the omission of a German firm to deliver goods ordered; to his liability on certain bills; and to bad debts. The examination was concluded.

JOHN GORDON WADSWORTH, trading as the Nene Road Electrical Co., 10, Westfield Terrace, Higham Ferrers, Northants, electrical engineer, &c.—The first meeting of creditors was held recently at the Official Receiver's office, 6, The Parade, Northampton, when a statement of affairs was submitted showing liabilities of £140, against assets of £11, leaving a deficiency of £129. The failure was attributed to lack of experience, too small a turnover, and a loss in connection with the purchase and sale of two motor cars. The matter remains in the hands of the Official Receiver as trustee.

D. J. DAVIES, wireless engineer, 36, Cambrian Street, Aberystwyth.—Receiving order made May 30th on debtor's petition.

C. SHEPHERD, radio engineer and dealer in wireless accessories, 69, Micklegate, York.—Last day for receiving proofs for dividend, June 18th. Trustee, Mr. D. S. Mackay, Official Receiver, Duncombe Place, York.

J. TUCKER (Bristol Radiator Co.), wireless dealer, 30, Lower Ashley Road, Bristol.—Receiving order made June 4th, on debtor's petition.

M. BAYNES (Langham Radio), wireless manufacturer, 96, Regent Street, W.1.—Application for discharge to be heard at Bankruptcy Buildings, Carey Street, W.C.2, on July 4th.

W. ROSS, wireless engineer, 35, Bridge Street, Haverfordwest.—Application for discharge to be heard at the Shirehall, Haverfordwest, on July 16th.

H. H. SPEKE, electrician, Avenue Road, Darlaston.—Trustee, Mr. F. E. Bendall, 3, Warwick Passage, Corporation Street, Birmingham, released May 2nd.

Company Liquidations.

M. CLEMINSON, LTD., 5-7, Dysart Street, E.C.—The first meetings of the creditors and shareholders were held on June 4th at Carey Street, W.C. Mr. E. T. A. Phillips, Official Receiver, reported that the company was registered as a private company on December 29th, 1925, to carry on business as importers, exporters and wholesale merchants of electrical and wireless goods, &c. The capital was £3,500 and the directors at the date of the winding up order were C. E. Cleminson and J. W. Rochester. Cleminson had stated that in 1923 he established a business in Bishop Auckland as a wholesale merchant dealing chiefly in electrical goods. He sustained a loss in respect of a large quantity of faulty goods received from Germany, and in order to evade further personal liability he promoted this company to take over and carry on the business in London. The purchase consideration was £2,348 in shares and the taking over of existing liabilities to the amount of £5,690. The company acted as agent for certain German firms and also purchased and sold goods on its own account. In 1927 a separate department was opened to deal with the electrical trade, and when it had resulted in a loss of £1,000 "Allite, Ltd." was formed to take over the stock belonging to this branch of the business, the consideration being £700 in cash and shares. In January, 1929, the company accepted a number of bills of exchange drawn in favour of two German manufacturers as security for goods to be supplied. The manufacturers who had discounted the bills were adjudged bankrupt, and the company had to honour acceptances to the extent of £1,600 in excess of the amount of goods received. In order to meet certain of these bills and to provide security for discounting other of its acceptances the company handed debentures which it held in Allite, Ltd., to a German bank, and later the bank appointed Mr. Rochester as receiver and manager of Allite, Ltd. The property and assets of Allite, Ltd., would not realise sufficient to cover the debentures. The company had also given accommodation bills to the amount of £1,500 to another German firm and had been called upon to meet acceptances for £1,020. A draft statement of affairs showed total liabilities of £13,860, of which £10,860 was expected to rank, against assets of £440. Mr. Cleminson attributed the failure to the company having to meet the before-mentioned bills; to bad debts; and to goods having been sold at insufficient prices. The Official Receiver was of opinion that the overhead charges were much greater than the turnover and gross profit justified. Mr. F. S. Salaman was appointed liquidator.

M.E.D.A.S., LTD., electrical engineers, 185, Hammersmith Road, W.—Under the compulsory liquidation of this company accounts have been lodged showing a total indebtedness of £2,861, and assets of £840, leaving a deficiency of £2,991 with regard to contributories, the issued capital amounting to £970.

Mr. J. Barwick Thompson, Official Receiver, reported that the company was registered in January, 1929, with a nominal capital of £3,150 to acquire the business of electrical, radio, lighting and heating engineers and contractors carried on by A. C. L. Covell and D. J. Quenzer. The trading to January 29th, 1930, showed a net loss of about £2,074, which was attributed to unremunerative contracts and heavy expenses incurred in connection with an agency which proved unsuccessful. Debentures for £2,200 were created in May, 1929, and a balance of £1,714 was due on the bonds when a receiver was appointed on January 29th, 1930. There is no likelihood of sufficient moneys being realised to meet the debenture-holders' claims. In the opinion of the Official Receiver the failure is attributable to mismanagement on the part of the directors in that the working capital provided was totally inadequate. Mr. O. G. Sunderland has been appointed liquidator.

WYNSOR ELECTRIC RANGE CO., LTD., 31, Lombard Street, E.C.—The first meetings of the creditors and shareholders were held on June 5th at Carey Street, W.C. A draft statement of affairs was presented showing liabilities of £2,702, against assets of £386, leaving a deficiency of £3,316 with regard to contributories, the issued capital being £1,000. The winding up order was made on May 5th upon a creditor's petition. The company was formed in May, 1929, to acquire from Louis Burn a business carried on as the "Windsor Electric Range Co.," and to trade as manufacturers of and dealers in electric cookers, radiators, and stoves. Burn was the inventor of certain improvements relating to such appliances. The purchase consideration for the business was £1,000 in cash, which was returned in payment for 998 shares, and the stock was taken over for £199. The company opened several agencies in this country and also in Australia, New Zealand, and South Africa. The failure was attributed to insufficient capital and to disputes with the suppliers owing to faulty workmanship and delay in the delivery of ranges. A liquidator will be appointed by the Registrar in due course.

PHANTESTRA (RENN'S GRAMOPHONE & WIRELESS), LTD.—The first meetings of creditors and shareholders under the compulsory liquidation of this company were held at Carey Street on June 6th. A draft statement of affairs submitted showed unsecured liabilities of £32,548, preferential claims amounting to £750, and debenture bonds and interest totalling £38,078. The assets were valued at £47,822. The position of the company was attributed to the failure of a public issue of capital and in the opinion of the Official Receiver lack of working capital was a contributory cause. A liquidator is to be appointed by the Registrar in due course.

RECORDAPHONES, LTD.—First meeting of creditors and contributories at Bankruptcy Buildings, Carey Street, W.C.2, on June 18th.

SYMPHONY GRAMOPHONE & RADIO CO., LTD.—Mr. H. Morgan, 54, New Broad Street, E.C.2, appointed liquidator (with a committee of inspection) on May 28th.

Dissolutions of Partnership.

FAIRLOP MOTOR WORKS, electrical engineers, &c., Barkingside.—Mr. F. J. Macey and Miss L. I. Harvey have dissolved partnership. Mr. F. J. Macey will carry on the business and attend to debts.

VENUS RADIOPHONE CO., Palace Hotel Buildings, Kirkgate, Huddersfield.—Mr. F. K. Harburn and Mr. J. T. Thornton have dissolved partnership. Mr. J. T. Thornton will attend to debts and carry on the business.

Private Arrangements.

G. E. MORRIS, electrical and radio engineer, trading as "Baldwin's," Littlehampton, Sussex.—The creditors in this matter met on June 4th at the offices of Mr. A. E. Orbell, 6 and 7, Old Steine, Brighton. The statement of affairs showed liabilities of £400, all due to the trade, and net assets of £63, leaving a deficiency of £337. Mr. Orbell reported that the debtor took over the business last year, agreeing to pay £500 for the stock, goodwill, &c. His mother paid the purchase price and gave the debtor £50 as capital. Accounts for the six months to October 31st, 1929, showed sales of £1,063, with a net profit of £31, while the debtor's drawings were £153. The creditors decided that the stock, fixtures, fittings, &c., should be sold.

T. H. V. JACKSON, trading as the Sheffield Wireless Depôt, 178, Norfolk Street, Sheffield.—At a recent meeting of creditors a statement of affairs was submitted showing liabilities of £606 and a deficiency of £232. The debtor's solicitor stated that his client had been interested in the wireless trade for a number of years. He commenced trading on his own account last October with a capital of £40, of which £25 was borrowed. No details of the trading were available, but it was stated that the position had been brought about through bad trade. Recently creditors had been pressing. A resolution was passed in favour of the matter being dealt with under a deed of assignment with Mr. T. A. Stoker, Leeds, as trustee.

New Catalogues and Lists.

Mr. ALAN WRIGHT, 117, Victoria Street, S.W.1.—An illustrated leaflet dealing with the "Inventum" off-peak water heater.

Messrs. C. C. MACBRIDE, Southern Railway Goods Sidings, Hampton, Middlesex.—A telephone card at the bottom of which is advertised new and second-hand plant supplied by the company.

Messrs. HEYES & CO., LTD., Water Heyes Electrical Works, Wigan.—A leaflet drawing attention to the "Lacent" lighting fitting for use in corridors, subways, staircases, &c. Priced.

EQUIPMENT AND ENGINEERING CO., LTD., 2 and 3, Norfolk Street, Strand, W.C.2.—A leaflet illustrating in colour Holmes-Reyrolle automatic traffic control signals.

MESSRS. GALLIERS, 32, St. James' Street, Brighton.—"Galliers' Electrical Bulletin" for June contains, in addition to notes on the company's activities, an interesting article on the use of electricity on the Panama Canal.

BRITISH ELECTRIC TRANSFORMER CO., LTD., Wellington House, Strand, W.C.2.—An illustrated catalogue of "Tricity Sunray" radiators, which includes a number of new models. Priced. Also a catalogue of "Kye" electric lamps announcing reduced prices.

Messrs. CHARLES CLIFFORD & SON, LTD., Fazeley Street Mills, Birmingham.—A well-produced brochure describing "Al-durbra," an aluminium brass.

B.E.N. PATENTS, LTD., 92, Tottenham Court Road, W.1.—List No. C.B.9, drawing attention to the "Pneu-Spray" finishing plant. Illustrated and priced.

Messrs. YOUNG & WILDSMITH, LTD., 35, Little Russell Street, New Oxford Street, W.C.1.—A price list (No. 10) of electrical accessories.

Messrs. CHESTERTON, JONES & CO., LTD., "David" Works, Rushey Lane, Tyseley, Birmingham.—An illustrated folder advertising "Davidson" electrical domestic appliances, including irons, kettles, fires, cookers, &c.

ELECTRICAL EQUIPMENT & CARBON CO., LTD., 107-109-111, New Oxford Street, W.C.1.—List No. SI.15, giving brief particulars of the "Mego-Meter" insulation testing set.

Messrs. A. P. LUNDBERG & SONS, 477 to 489, Liverpool Road, Holloway, N.7.—Leaflets No. EI.91, EI.92, and EI.93, dealing, respectively, with two-pin flat extension connectors, double-push switches, and miscellaneous adaptors. Illustrated and priced.

Messrs. BERTRAM B. FENN, LTD., "Fenbo House," Great Chapel Street, Oxford Street, W.1.—A price list, illustrating in colour "Fenbo" glareless crystal lamps.

Messrs. WM. SANDERS & CO., Falcon Electrical Works, Wednesbury.—A folder containing illustrations and brief particulars of "Superior" switches.

EDISON SWAN ELECTRIC CO., LTD., 123-5, Queen Victoria Street, E.C.4.—A folder containing illustrations, prices and particulars of "X-Ray" reflectors. Also an illustrated leaflet drawing attention to "Fabrolite" wall plugs and sockets.

INDUSTRY & COMMERCE ALLIANCE, LTD., 55/59, Kingsway, W.C.2.—A catalogue describing the "Elimafuse" small circuit breaker. Illustrated and priced.

Messrs. FALK, STADELMANN & CO., LTD., 83 to 93, Farringdon Road, E.C.1.—Price list No. P.1412 of "Hitest" cables and "Efesca" flexibles.

Messrs. JOHN SHAW & SONS, WOLVERHAMPTON, LTD., Wolverhampton.—Circulars Nos. 1050, 1550, 1650 and 2650 dealing respectively with the "One-hand" hair dryer, "Trojan" high frequency electrical outfits, electric cigar lighters, and electric fans. Illustrated and priced. Also an illustrated catalogue of "Governor" switches, switch plugs, &c.

Messrs. FERRANTI, LTD., Hollinwood, Lancs.—A number of publications respectively illustrating and describing the Ferranti h.t. supply unit, constructional types 7 and 8; fixed condensers; radio meters; valve testers; and the Ferranti anode feed system. Priced.

Messrs. CROMPTON PARKINSON, LTD., Bush House, Aldwych, W.C.2.—A two-colour folder illustrating a number of factories in various industries in which the company's motors are installed.

NORTH METROPOLITAN ELECTRIC POWER SUPPLY CO., Northmet House, Cannon Hill, Southgate.—A neat desk telephone card.

Calendar blotters for June have been received from Messrs. S. ROGERS & CO., LTD., 15, Fitzroy Street, Tottenham Court Road, W.1; POPE'S ELECTRIC LAMP CO., LTD., Elasta House, 5, Arthur Street, New Oxford Street, W.C.2; and the JACKSON ELECTRIC STOVE CO., LTD., 143, Sloane Street, S.W.1.

The Timber Market.

Our Timber Trade Correspondent reports that the demand for timber for house and general building requirements is keeping up well. The call for hardwoods, on the other hand, is not so brisk, but for mahogany, teak, cedar, and fancy woods generally, in the log, the market is very firm, especially for the better grades, which are in but small supply. American sawn varieties are in good stock, but forward values are unsteady, which is reflected on the spot for wholesale quantities as well as for sawn varieties from other countries. As regards the plywood market, European shippers are offering small concessions on prompt orders; stocks in the United Kingdom, however, are large, and the demand lacks strength, but it is believed that this quietness is only of a temporary character.

Price Reductions.

The FULLER ACCUMULATOR CO. (1926), LTD., announces reductions in the prices of certain of its motor-cycle batteries.

Wages in the Electrical Contracting Industry.

In view of the revised rates of wages for journeymen to come into operation on the second pay-day in June for the period covered by that pay-day, the National Federated Electrical Association states that the corresponding rate for mates under the London Agreement will be 1s. 5½d. per hour.

The Buenos Aires Exhibition.

The British Empire Trade Exhibition which is being organised by the British Chamber of Commerce in Buenos Aires from March 14th to April 27th, 1931, is being officially supported by the Government, and the Department of Overseas Trade is organising an exhibit in a separate building. The British banks, railways, shipping and cable companies, and other British commercial undertakings in Argentina are giving their warm approval and financial support. The Canadian Government is also organising a series of exhibits. The Exhibition will be organised in a series of industrial sections which will include textiles, wearing apparel, footwear; applied science, chemicals, foodstuffs, beverages, toilet requisites; applied art, furniture and sport; building and decoration, household machinery, &c. The machinery group will consist of sections representing electrical equipment, hardware, small tools, light machinery, &c., heavy machinery of all descriptions, agricultural machinery and implements, factory equipment, heavy chemicals and oils, locomotives, railway and tramway equipment, road-making machinery, motor cars, cycles and commercial vehicles, aviation and motor boats. A large amount of the available space has already been taken by British firms and commercial organisations, who realise the value of the opportunity afforded by the Exhibition as a means of stimulating their trade with Argentina. The address of the London committee of the Exhibition is:—The General Manager, British Empire Trade Exhibition, Buenos Aires, 1931, 5, Parliament Mansions, Orchard Street, Victoria Street, S.W.1 (Telephone: Victoria 0877), from whom full information regarding the scope of the Exhibition, the cost of exhibiting space, details as to stand erection, services and supplies, and the transport of exhibits, &c., can be obtained.

Prices of Materials.

The following prices are only general, and they may vary according to quantities and other circumstances:—

	CHEMICALS, &c.	Price June 10th.	Fortnight's inc. or dec.
a	Acid, Oxalic ... ... per lb.	5¾d.	...
a	Ammoniac, Sal ... ... per ton	£60	...
a	Ammonia, Muriate (large crystal) ,,	£52	...
a	Bisulphide of Carbon ... ... ,,	...	...
a	Borax ... ... ,,	£25	...
a	Copper Sulphate ... ... ,,	£25 10s.	...
a	Potash, Chlorate ... . per lb.	3d. to 4d.	...
a	,, Perchlorate ... ... ,,	5½d.	...
a	Shellac ... ... per cwt.	£13 10s.	...
a	Sulphur, Commercial ... ... ,,	£11	...
a	,, Roll ... ... ,,	£11	...
a	Soda, Chlorate ... ... per lb.	3d.	...
a	,, Crystals ... ... per ton.	£5 to £5 5s.	...
a	Sodium Bichromate, casks ... per lb.	3⅝d.	...
	METALS, &c.		
b	Aluminium, Ingots ... ... per ton.	£95 to £100	...
b	,, Wire ... ... per lb.	1/1 to 1/9	...
b	,, Sheet ... ... ,,	1/1 to 2/9	...
p	Babbitts Metal and Anti-friction Metals—		
	Grade I ... ... per ton net.	£134	£2 dec.
	Grade II ... ... ,, ,,	£95	£2 dec.
	Grade III ... ... ,, ,,	£56	£1 dec.
c	Brass (rolled metal 2" to 12" basis) per lb.	8¼d.	...
c	,, Tubes (solid drawn) ... ,,	11d. to 11½d.	...
c	,, Wire, basis ... ... ,,	9¾d.	...
c	Copper Tubes (solid drawn) ... ,,	1/0½	...
g	,, Bars (best selected) ... per ton	£87	...
g	,, Sheet ... ... ,,	£87	...
g	,, Rod ... ... ,,	£87	...
d	,, (Electrolytic) Bars ... ,,	£61 10s.	...
d	,, ,, Sheets ... ,,	£143 10s.	...
d	,, ,, Wire Rods ,,	£70	...
d	,, ,, H.C. Wire per lb.	9½	...
f	Ebonite Rod ... ... ,,	2/3 to 2/6	...
f	,, Sheet ... ... ,,	2/3 to 2/6	...
n	German Silver Wire ... ... ,,	2/1	...
h	Gutta-percha, fine ... ... ,,	nom.	...
h	India-rubber, Para fine ... ,,	7¾d.	¼d. dec.
i	Iron, Pig (Cleveland No. 3.) ... per ton.	79/6	...
l	,, Wire, galv. No. 8. P.O. qual. ,,	£20	...
g	Lead, English pig ... ... ,,	£19 10s.	...
g	Mercury ... ... per bot.	£22 15s.	...
e	Mica (in original cases) small ... per lb.	6d. to 3/-	...
e	,, ,, medium ,,	4/- to 8/-	...
e	,, ,, large ... ,,	10/- to 20/- & up	...
p	Phosphor Bronze, plain castings ,,	1/2½d.	...
p	,, ,, drawn bars & rods ,,	1/3	...
p	,, ,, rolled strip & sheet ,,	1/8½	...
p	,, ,, wire ... ... ,,	1/8½	...
o	Platinum ... ... per oz.	£8 15s.	...
d	Silicium Bronze Wire ... ... per lb.	10¾d.	...
r	Steel, Magnet, in bars ... ... ,,	7¾d.	...
g	Tin, Block (English) ... ... per ton	£138 15s. to £139 5s.	£5 10s. dec.
n	,, Wire, Nos. 1 to 16 ... ... per lb.	3/2	...

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a	G. Boor & Co.	*g*	James & Shakespeare.
b	The British Aluminium Co., Ltd.	*h*	Edward Till & Co.
c	Thos. Bolton & Sons, Ltd.	*i*	Bolling & Lowe.
d	Frederick Smith & Co.	*l*	Richard Johnson & Nephew, Ltd.
e	F. Wiggins & Sons.	*n*	P. Ormiston & Sons.
f	India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.	*o*	Johnson, Matthey & Co., Ltd.
		p	C. Clifford & Son, Ltd.
		r	W. F. Dennis & Co.

In their letter dated June 6th, Messrs. James Forster and Co. stated that quiet conditions again prevailed in the lead market last week, and prices moved within narrow limits. The demand from consumers is still very quiet both in this country and on the Continent, while supplies are ample. A little official support has been given on any sign of prices weakening.

Lighting and Power Notes.

Barrow-in-Furness.—LOAN SANCTIONED.—The Town Council has received sanction to the borrowing of £5,000 for house-wiring installations for hire-purchase.

Birkenhead.—PROGRESS IN ELECTRICITY SUPPLY.—A further step in the electrification of the Wirral Peninsula has been completed by the connecting up of Greasby Village with the mains of the Corporation electricity undertaking which now supplies twenty-eight parishes and the urban areas of Bebington and Bromborough, and Neston and Parkgate. Nearly 300 miles of h.p. and l.p. mains are used in an area of over seventy square miles. About 21,000 householders, including consumers in the borough, take a supply for the Corporation, as compared with 8,000 six years ago. Last year the consumption was 24,593,680 kWh, as compared with 10,534,270 kWh in 1925. Over 12,000 cookers, fires and other appliances are being used. Overhead lines are being erected to supply electrical energy from Greasby to the Wirral Council's sewage works at Saughall Massie.

Blackburn.—EXTENSIONS.—The Town Council has approved the supply of electricity to Hall Street Mill Co. at a cost of £1,200, including sub-station equipment. The amended terms for the supply of electricity to Messrs. Livesey's wood mills have also been approved.

CHANGE-OVER.—The Council is to change over the supply to Little Harwood from d.c. to a.c., at a cost of £6,561.

Brecon.—POWER STATION EXTENSIONS.—The Town Council has applied for sanction to install a 75-kW generating set and to enlarge the generating station, and for a loan of £2,735 to meet the cost. This decision is in consequence of a bulk supply not being available for at least twelve months.

Chester.—PUBLIC LIGHTING.—The City Council is to proceed with a scheme of public lighting at an estimated cost of £13,000.

WATER-HEATING TARIFF.—The Council has decided to introduce a tariff for commercial water-heating between the hours of 6.30 p.m. and 3.30 p.m. of ½d. per kWh.

Colchester.—MAINS EXTENSIONS.—The Corporation Electricity Committee has authorised the borough electrical engineer to arrange for the erection of h.p. lines in the following places:—Great Holland, £1,102; Rowhedge, £1,350; Alresford, £725; and Weeley, £705.

STREET LIGHTING.—The Electricity Committee has agreed to terms submitted by the commercial engineer and approved by the parish council for lighting streets at St. Osyth by electricity.

LOANS.—The Electricity Committee is applying for sanction to a loan of £20,000 for mains and services, and £20,000 for the purchase of cookers, wiring, slot meters and fittings.

Continental.—TURKEY.—According to the report of the Société Turque d'Electricité, the power stations of the company are now supplying electricity to 55,371 consumers, representing 54,747 kW, in the Constantinople district, these figures showing an increase of 4,493 consumers and 3,342 kW, respectively, during the past twelve months. The sales during 1929 amounted to 55,245,325 kWh, as compared with 51,903,341 kWh in the preceding year.

POLAND.—The Minister of Public Works has instructed the Polish Power Committee (Polski Komitet Energetyczny) to prepare detailed plans for the electrification of the whole of the territory of the Polish Republic. It is stated that the Polish Power Committee has already started on this work, and that the supervision and direction of the whole work has been entrusted to Engineer Sokolnicki, professor at the Lwow (Lemberg) Polytechnical Institution.—*Reuter* (Warsaw).

ITALY.—According to a return published by *L'Energia Elettrica*, the installed capacity of the hydro-electric plants in operation in Italy at the end of March last amounted to 3,291,000 kW, as compared with 2,820,000 kW at the corresponding date of last year, while the capacity of the plants operated by steam and internal combustion engines increased from 672,000 to 722,000 kW. The output from the various stations during the three months ended March last amounted to 2,335,748,000 kW, as against 2,211,225,000 kW in the corresponding quarter of 1929.

GREECE.—After long negotiations an agreement has recently been arrived at between a Belgian syndicate and the Greek Government to provide the town and district of Salonica with an electric power supply. A hydro-electric station of a capacity of 20,000 h.p. is to be erected at Verrai about 44 miles from Salonica.

Dartford.—LOAN SANCTIONED—The Urban District Electricity Committee has obtained sanction to the borrowing of £2,569 for mains and plant.

Dover.—YEAR'S WORKING.—The accounts of the Corporation Electricity Department (engineer: Mr. R. C. Harpur) for the year ended March 31st last show a total revenue of £49,846, a working expenditure of £23,955 and a gross profit of £20,891. The corresponding figures for the preceding year were: Total income, £50,502; working expenses, £24,599; gross profit, £25,903. To the gross profit was added £6,956, balance from

the last account, and £104 interest, making a total of £27,952 available. After providing for capital and other charges there was a net surplus of £2,641, as compared with £6,956 in the preceding year. The sales of electricity increased from 3,157,516 to 3,387,581 kWh. The maximum supply demanded was 1,324 kW a.c. and 512 kW d.c. The average price obtained per kWh decreased from 3.84d. to 3.53d.

Eastbourne.—NEW TARIFF FOR ALL-ELECTRIC HOUSES.—The Corporation Electricity Committee has approved a suggestion of the electrical engineer to adopt a two-part tariff for the supply of electricity to all-electric houses on the Downlands estate and elsewhere, the fixed charge to be 20 per cent. of the rateable value and the "unit" charge 1d., with a minimum consumption of 500 kWh per quarter.

East Grinstead.—SUPPLY AREA EXTENSION.—The Urban District Council has applied to the Electricity Commissioners for a Special Order to extend its area of supply to Forest Row.

Hebden Bridge.—CHANGE-OVER.—The Urban District Council has received sanction to a loan of £5,754 for work in connection with another section of the change-over in the system of electricity supply.

Hull.—SCHOOL LIGHTING.—At a meeting of the Education Committee held recently, the director reported that provision had been made in the estimates for the installation of electric lighting in those elementary schools at present lighted by gas and which were used for evening school purposes. There were nine schools concerned and the estimated cost was £5,262.

MAINS EXTENSIONS.—The Corporation Electricity Committee has obtained sanction to the borrowing of £110,858, for the laying of supply mains in various parts of the city.

India.—EXTENSIONS.—The Bombay Government has granted a licence to the Konkan Electricity Co. to supply electrical energy in the Malad-Borivli area and the Bhinvdi-Ambernath area.

The Nagpur Electric Supply Co. showed further progress during the last year. Two new turbo-alternator sets of 500 kW each and two rotary convertors of 300 kW each are now being erected. When the whole plant is in operation, the total capacity of the power house will be 1,300 kW. H.p. distributing mains are being laid and the work will be completed soon. New sub-stations have been erected. Now that the negotiations with military authorities have been completed, the company will provide electrical energy to the Fort area.

ELECTRICITY SUPPLY FOR KASAULI.—An electricity supply company has been started at Kasauli station with a capital of Rs. 5 lakhs. The station is situated on the outer Himalayas 6,200 ft. above sea level. The company will at first charge 8 annas per kWh for lighting and a lower rate for power.

Kirkham.—STREET LIGHTING.—A committee of the Urban District Council has been appointed to consider the conversion of existing street gas lamps to electricity.

Leyton.—LOANS.—The Town Council has applied for sanction to loans of £5,100 for changing over the Lea Bridge area from d.c. to a.c., and £30,000 for mains and services.

Liverpool.—NEW PLANT AND SWITCHGEAR.—The Lighting and Extensions Sub-committee of the Corporation Tramways and Electric Power and Lighting Committee has authorised the city electrical engineer to install two 750-kVA transformers and l.p. boards in Lodge Lane sub-station at an estimated cost of £1,100 and to advertise for tenders for h.p. and l.p. switchgear for static sub-stations.

Maidenhead.—REVISED ELECTRICITY CHARGES.—The Town Council has made the following revisions in charges for electricity:—Flat-rate tariff for lighting on rental and prepayment meter accounts: After the first 25 kWh in each summer quarter and 75 in each winter quarter, a reduction of ½d. per kWh. Two-part tariff for business premises: The annual fixed charge above £5 to be reduced by 10 per cent. Two-part tariff for business premises and two-part assessment tariff for private houses: The secondary charge to be reduced within the borough by 0.125d., and outside the borough by 0.10d. per kWh.

Nigeria.—INAUGURATION OF SUPPLY.—The undertaking of the Nigerian Electricity Supply Corporation was put into operation at the beginning of this week.

Salford.—YEAR'S WORKING.—The Corporation electricity undertaking for the year ended March 31st last, made a net profit of £26,687, as against 29,825 the previous year. The gross income was £318,218, the figure for the preceding year being £307,669. To the reserve fund, which stands at £65,691, has been added £10,000 out of profits, plus £4,659 representing interest, &c., bringing the total to £80,350. The balance of profits has been used for the purchase of meters, cookers, appliances, &c.

Stoke-on-Trent.—CHANGE-OVER.—In connection with the change-over of supply in that portion of the centre of Stoke which lies to the east of Liverpool Road, application is to be made by the Corporation Electricity Committee for sanction to a loan of £5,000, the estimated cost of the three-phase h.p. distributors in Kingsway, Church Street, Copeland Street and Wharf Street, Stoke, together with the necessary feeder pillars to control the supply. The Electricity Committee is also to change-over the supply of electricity in Longton at a cost of £1,000.

MAINS EXTENSIONS.—Mains extensions are to be carried out at a cost of £1,050 to supply an estate being developed by the Sutton Trustees in Trent Vale.

Torquay.—LOANS.—The Corporation Electricity Committee is applying for sanction to the borrowing of £7,500 to re-cable the urban district of Buckfastleigh, and £1,000 for transformers and accessories required at Paignton.

Wakefield.—LOAN SANCTIONED.—The Corporation Electricity Committee has obtained sanction to a loan of £5,000 for the provision of domestic apparatus for hire.

West Lancashire.—OFFER TO PURCHASE UNDERTAKING REFUSED.—The Rural District Council has rejected an offer made by the Lancashire Electric Power Co. to acquire the Council's electricity undertaking. At a recent meeting of the Council the chairman of the Electricity Committee said that the Committee did not think the time opportune to hand over the undertaking, which was a valuable one, and in fact he did not think it was the intention in the near future even to consider the matter.

LOAN SANCTIONED.—The Council has received sanction to the borrowing of £27,337 in respect of the supply of electricity to Tarleton.

Tramway and Railway Notes.

Aberdeen.—PROPOSED TRAMWAY ABANDONMENT.—The Corporation Tramways Committee recommends the abandonment of the Torry tramway service and substitution of motor-buses.

Argentina.—BUENOS AIRES.—The *Review of the River Plate* states that Señor Atanasio Iturbe, who is a local director both of the Central Argentine Railway and the Anglo-Argentine Tramways Co., was received in audience recently by President Irigoyen to discuss a new proposal for the construction of an underground railway which the Anglo-Argentine Tramways Company intends to present to the Municipal Intendency shortly. The company offers to construct three underground lines diverging from a central station in the Plaza Mayo, and an extension of the existing line up to Calle San Pedrito in Flores. The first line thus would have for its basis the system actually in service between the stations of Plaza Mayo and Primera Junta, to be extended up to the intersection of Calles Rivadavia and San Pedrito. The second section would have its initial route between Plaza Britanica, in front of the Retiro Station of the Central Argentine Railway, and Plaza Constitucion, with an extension to the intersection of Calles Boedo and Caseros. The third line, starting from Plaza Mayo, would have as the terminal of its first section the Palermo Station of the Buenos Aires and Pacific Railway, and it would be extended eventually to Belgrano. The fourth line would start from Avenida Leandro N. Alem and would run to the intersection of Calles Gaona and Parral, whilst the fifth line would connect Plaza Mayo and Parque Chacabuco.

These works would involve 70 km. of new underground lines and an expenditure of 300 million paper pesos. The surface tramway system would be completely reorganised in order to effect co-ordination between it and the company's omnibus and underground system. The company asks for a 15-cent fare per journey on the underground, and it would maintain the existing 10 and 5 cent fares on the surface trams. It would undertake to have the services—with the exception of the extensions from Plaza Constitucion to Boedo and Caseros, and from Palermo to Belgrano—in operation in two years.

Australia.—NEW SOUTH WALES.—The New South Wales Government has received an offer from a London company to construct an electric railway to Newport costing £10,000,000. The company is willing to construct the line on condition that it is given control for sixty years, after which time the line would be handed over free to the Government.

Continental.—FRANCE.—It will be remembered that the Compagnie des Chemins de Fer du Midi opened its electrified trans-Pyrenean line from Ax-les-Thermes to Puigcerda, 43 km. long, in July last. In continuation of its programme the company has recently introduced electric traction between Toulouse and Ax-les-Thermes, a distance of 123 km. The trans-Pyrenean railway joins up, at the frontier station of La Tour-de-Carol, with an electrified line 109 km. in length coming from Perpignan.—*Reuter's Trade Service* (Toulouse).

SWITZERLAND.—The Swiss Federal Railway authorities have recently commenced operations on the electrification of the Jura line between Chaux-de-Fonds and Locle and the section between Biel, St. Imier, and Chaux-de-Fonds. The first is expected to be completed by October, 1931, and the second in the following year.

Japan.—TSURUMI POWER STATION OPENED.—The construction of the I.G.R. steam power station at Tsurumi, near Yokohama, was completed last month. The station, which has taken eighteen months to erect, will be utilised to supply power for the Government's railway electrification schemes.

Three 25,000-kW generators are to be employed, the first of which was put into commission on May 15th; the second will come into operation in the middle of August and the third by the end of November. When the equipment of the station is completed, two of the generators will be used to provide the 48,000 kW required for the Yokosuka, Atami, Central, Yamate, Akabane and Tokyo-Yokohama electric train services and the Government railway works, &c.; the third generator will be employed as a spare. The 36,000 kW of energy now supplied by the Tokyo Electric Light Co. and the 18,000 kW obtained from the Government's Akabane station will no longer be required, saving the payment of 4,300,000 yen per annum to the Tokyo Company. The operation of the Akabane station will be temporarily suspended but it will be brought into service again when the electrification of Tachikawa-Kofu section of the Central line is completed next January. When the I.G.R. station on the Shinano River is completed in 1940 the Government will have 141,000 kW of power at its disposal.

NEW ELECTRIC RAILWAY.—The Kwanto Electric Railway Co., which was formed recently for the purpose of operating an electric railway 36 miles in length from Koga to Tsuchiura, has decided to include the construction of the Koga-Iwaimachi section in the first portion of its programme. The single catenary system is to be adopted.

Liverpool.—TRAFFIC CONGESTION.—In his report to the Corporation on the traffic congestion in the city, Sir Henry Maybury suggests that more 'buses and railless cars should be provided in preference to tramcars, and that roundabout turns should be made for tramcars.

Manchester.—EXTENSION OF TIME.—The Minister of Transport has extended until June 15th, 1931, the period allowed for the completion of a portion of the tramways authorised by the West Manchester Light Railways Order, 1906.

YEAR'S WORKING.—We have received from Mr. R. Stuart Pilcher, general manager of the Corporation Transport Department, a copy of his report together with a statement of accounts of the undertaking for the twelve months ended March 31st last. The total revenue from the tramways amounted to £1,830,631, as compared with £1,814,705 in the preceding year, while the working expenses increased from £1,487,487 to £1,497,034, leaving a gross profit of £333,597 (£327,218). To the gross profit were added interest on investments and an unemployment grant, making a total of £351,272, from which the following sums had to be met:—Interest on loans, £123,228; bank interest, £4,701; sinking fund and loan instalments, £107,668; street improvements, £10,870; rent and leased lines, £43,618; fitting upholstered car seats, £2,263. There remained a balance of £58,923, which together with a surplus of £16,038 from the 'bus undertaking was transferred to the reserve and renewals account (net surplus); the previous year's working of the tramway and 'bus undertaking resulted in a net surplus of £80,408. The capital expenditure during the year amounted to £258,585, the principal items being £20,121 for permanent way, £20,789 for buildings and fittings at the Hyde Road depôt, £98,266 for garages, and £134,996 for motor-omnibuses. The total now spent on the undertaking stands at £4,702,281. The number of passengers carried by the trams increased from 322,815,254 to 326,286,679 and the car mileage from 24,456,250 to 24,477,216. The average revenue per car mile rose from 17.808d. to 17.949d. and the total consumption of electricity from 48,818,166 to 50,392,609 kWh. Complete overhead equipment was erected in Thompson Street and the renewal was effected of 13 miles of single track with cadmium-copper trolley wire. During the year 15 single-truck cars were converted into vestibule double-truck cars, all of which were fitted with new motors and cross seats in the lower saloon. This completes the programme of tramcar conversion and no expense will be incurred under this head this year. The number of cars in stock at the end of the year was 926.

Stretford.—EXTENSION OF TIME.—The Minister of Transport has extended until June 15th, 1931, the period allowed for the completion of the whole of the tramways authorised by the Stretford Light Railways Order, 1906.

Telegraph and Telephone Notes.

China.—TELEGRAPHY.—A programme of repair and improvement of all Government telegraph lines throughout China has been formulated by the Telegraph Administration Department of the Ministry of Communications. It is estimated that a period of six years will be required for the completion of the entire programme. During the first year a total of 4,773 miles of lines will be renovated, including the Nanking-Hankow, Peiping-Tientsin, Hangchow-Foochow, Foochow-Amoy, Swatow - Canton, Peiping - Hankow, Kiukiang - Canton, Hsuchow-Chengchow main telegraph lines and various branches attached thereto. During the second year, 3,398 miles of lines will be repaired, including the Hankow-Canton, Hsuchow-Tsingkiangpu, Hankow-Chungking, and Kalgan-Lanchow lines. In the third year 2,984 lines of other lines will be repaired. The following three years will be devoted to the replacement of old apparatus and other improvements for the various main and branch lines.

Imperial Communication.—TELEGRAPH RATES.—Sir Basil Blackett, chairman of Imperial and International Communications, Ltd., announced to the Imperial Press Conference in London last week that so soon as the amalgamation of cables and wireless services in India, Australia, and South Africa had been approved by the Governments concerned the cable rate would be reduced to the level of the wireless rate.

International Telephony.—ANGLO-LATVIAN SERVICE.—A public telephone service was inaugurated on June 5th between all parts of Great Britain and all parts of Latvia.

Porto Rico.—TELEPHONY.—There are now 1,072 miles of telegraph lines in operation in Porto Rico, or only about 0.2 mile for each 1,000 of the inhabitants. The number of telephone instruments in use in the country is given as 13,374, or 9.2 for each 1,000 of the population.

Rumania.—TELEPHONIC CONCESSION.—With reference to earlier reports of the granting of a concession for modernising the country's telephone system (see ELEC. REV., April 11th, 1930, p. 689), *Reuter's* Bukharest correspondent states that the Rumanian Cabinet has agreed to grant to the International Telephone and Telegraph Corporation of America a 20-year concession for modernising the telephone and telegraph services and linking-up the country with all European centres.

South Africa.—TELEPHONY.—Good progress has been made with the comprehensive scheme of interlinking telephonically the important towns of the Union with the aid of long-distance repeater lines. There is also a tentative plan for establishing a circuit to Southern Rhodesia, while the Lourenco Marques and Union systems will be linked within a year.

Telephony.—SWEDISH-GERMAN CO-OPERATION.—At the annual meeting of the Swedish Ericsson Company it was mentioned that a system of co-operation with the Siemens and Halske Company had been established this year. Not only would the former have about 40 per cent. of the contract secured by the German company for the re-construction of the telephone network in Greece, but it would also participate in the establishment of a network in the Italian provinces of Bari and Otranto, including the towns of Bari and Brindisi, the concession for which is reported to have now been awarded to the Siemens group. According to a German report, the association of the Siemens group with the Swedish company is partly due to the circumstance that in the working-up of concessions the latter has had more experience than the former, which has hitherto been more of a purely manufacturing firm.

West Africa.—WIRELESS COMMUNICATION.—The station at Monsanto (near Lisbon) and that of St. Thomé (West Africa) have given excellent results. A great saving of both time and expense is anticipated, seeing that up to the present all official messages have had to be exchanged over privately-owned cable companies. It is believed that the Government will later on authorise private messages to be sent by these military installations.—*Reuter* (Lisbon).

Radio Notes.

France.—SCHOOL RECEPTION.—An official inquiry has disclosed the fact that 2,228 schools are provided with receiving sets, excluding those privately owned by masters, which are often used for the benefit of pupils.

International Broadcasting.—NEW SERVICE.—It is reported that, in about eight weeks' time, two high-powered stations, designed to secure easy reception all over the British Isles, will be opened near Louvain, in Belgium, and will provide British programmes. One of the stations is the property of the Radio-Belgique Corporation; the other belongs to the Flemish Catholic party, which is interested in preserving the Flemish language. Both will be heard in Britain with greater strength and clarity than 5GB, it is claimed, and they have both agreed to broadcast regular programmes for British listeners at convenient hours, says the *Daily Express*. Some 18 foreign stations, in addition to the two near Louvain, and including that at Algiers, have agreed to radiate regular programmes in English. This interesting Continental enterprise is the work of the International Broadcasting Company, formed by London business men.

Arrangements have been completed between the British Broadcasting Corporation and the Columbia system, U.S.A., for a regular series of trans-atlantic broadcasts at 5.30 p.m. B.s.t. from time to time.

Licences.—STILL INCREASING.—The number of broadcast radio receiving licences in force on April 30th, 1930, totalled 3,117,000.

National Theatre.—WIRELESS LICENCE REVENUE.—In connection with the scheme to build a national repertory theatre in London as a Shakespeare memorial, it is suggested that

the Government should make an annual grant of £100,000 for a number of years to meet interest and sinking fund charges, such grant to be made from the proceeds of wireless receiving licences.

Norway.—REORGANISATION.—A reorganisation plan is to be submitted to the Storting, the Norwegian Parliament. At present four private companies operate transmitters within separate and limited concession areas—*viz.*, the Kringkastingselskapet A.S., Oslo, with transmitters in Oslo, Nidaros (formerly Trondhjem), Fredriksstad, Hamar, Porsgrund, Notodden, and Rjukan; Bergen Kringkastingselskap, operating the Bergen transmitter; the Aalesund Kringkastingselskap, operating the Aalesund station; and Tromsö Kringkastingselskap, operating the Tromsö station. According to *World-Radio* the proposal recommends the formation of a new company, limited by shares, with the State as principal shareholder, to exist only until all the stations, present and prospective, have been paid for, which is calculated to be in 1938. The total expenditure is fixed at £250,000. The plan provides for forty-three transmitters, giving crystal-set reception to about 90 per cent. of the total population (about three millions). The present licence fee of Kr. 20 (22s. 6d.) per annum will be reduced to Kr. 15 (17s.). Listeners number about 76,000 at present. The total licence income will go to the new company, which will pay one-third of the licence fees received to another body to be established (a programme company representing the whole of Norway) and also a yearly sum of about £11,000 to the State. The proposed programme company is to be organised by the Press organisation, the telegraph bureau, the Norwegian Association of Newspaper Owners, and the Association of Oslo Newspapers. Local programme councils will be formed in the more important towns, and a chief programme council for the whole of Norway. On the latter the following will be represented: the Department of Church and Education, the Department of Commerce, the University and high schools, Press organisations, theatres, music organisations, authors' organisation, and listeners. All the 43 transmitters will, it is expected, be put into operation by 1934.

Radio Exchange.—BLACKBURN.—An application to the Town Council by Mr. J. E. Lynch for permission to establish a wireless relay station in the Devonport Road district has been referred to a special committee for consideration.

Static Interference.—MANCHESTER.—The Postmaster-General has communicated with the municipal Corporation Baths Committee with reference to the emission of magnetic waves of radio-frequency from the electric power plant at the public wash-house, Levenshulme, which are alleged to be interfering with broadcast reception in the neighbourhood. Experiments have been carried out with the concurrence of the chief electrical engineer of the Corporation with a view to the elimination of such interference.

Uruguay.—NEW SERVICE.—By virtue of a law passed recently, an official broadcasting service has been created, says *World-Radio*, under the Department of Public Education. An honorary commission composed of five members, three of whom are to be appointed by the National Administrative Council upon nomination by the Minister of Public Education, one by the University Council, and the other by the Council of Primary and Normal Education, will prepare, broadcast, or rebroadcast programmes for the use of public schools. The expenses of the service will be met by receipts from a duty of 60 per cent. on the value of all radio sets and their accessories, and on gramophones also, imported into the republic; a duty of 10 centavos (about 5d.) on each gramophone record imported; a licence fee of 10 pesos (about £2 2s.) annually for each receiver in the republic; and a fine of 100 pesos for theatres and public halls refusing to allow performances to be broadcast upon request of the Commission, unless a performance is given from the studio. Twenty per cent. of the revenue thus received will be devoted to the purchase of new equipment and the improvement of that already in use. The former station of the Department of War and Marine will be the transmitter.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the ELECTRICAL REVIEW containing the advertisement is given in parentheses below.

Contracts Open.

Australia.—MELBOURNE.—July 9th. City Council. Supply of totally-enclosed metal-clad switchgear. (B.X. 6401.)*
Posts and Telegraphs Department. August 19th. Telephone jacks. (B.X. 6477.)

Belfast.—July 5th. Electricity Department. H.p. switchgear, transformer kiosks with h.p. and l.p. switchgear, and static transformers. (June 6th.)

Birmingham.—July 1st. Asylums Committee. Installation of complete system of electric lighting and power supply at Uffcolme Mental Hospital, King's Heath. Specification (deposit £5) from H. H. Humphries, city engineer, Council House.

Cardiff.—July 1st. Public Health Department. H.p. and l.p. switchboards, transformers, battery and charging plant for Llandough hospital. (June 6th.)

Chile.—SANTIAGO.—July 29th. State Railway. Electric clocks. (B.X. 6472.)*

Dundee.—June 25th. Electricity Department. E.h.p. switchgear and bus-bar reactors in the Caroline Port power station. (June 6th.)

East Ham.—June 18th. Education Committee. Installation of electric lighting at the Monega and Sandringham schools. (May 23rd.)

Egypt.—CAIRO.—August 17th. Mechanical Department. Ministry of Public Works. Supply and election of 15 electric pumping stations, with pumps, motors, switchgear, &c. Specifications, &c. (deposit £10 5s.) from the chief inspecting engineer, Egyptian Government, 41, Tothill Street, S.W.1. Tenders to the Director-General, Mechanical and Electrical Department, Ministry of Public Works, Cairo.
July 26th. Ministry of the Interior. Supply and erection of a cooling tower for the electric power station at Assiout. (A.X. 9627.)*
TOR QUARANTINE.—June 30th. Ministry of Public Works. Generating unit with accessories, motors, and erection of transmission lines and cordon lighting round a camp. (B.X. 6466.)*

Irvine (Ayrshire).—June 16th. Town Council. Electric lighting of 80 houses. Specifications (deposit £1 1s.) from Mr. A. R. Wilson, town clerk.

Kippax.—West Riding Education Committee. Electric lighting installation at the Council School. Specifications from H. W. Powell, Education Offices, Garforth.

Leeds.—June 16th. Tramways Committee. 100 tramcar bodies; 100 tramcar trucks, including wheels and axles; 100 tramcar pneumatic brake equipments; 100 tramcar electrical equipments. Specifications, &c., from Mr. R. L. Horsfield, general manager and engineer.
June 26th. Libraries and Arts Committee. Electric lighting installation at Hunslet library. Specifications from J. E. Acfield, city engineer, Municipal Buildings.

London.—CENTRAL ELECTRICITY BOARD.—June 19th. Supply, delivery, and laying of 33-kV and other cables for the Central England Electricity Scheme, 1928. (May 23rd.)
June 23rd. Supply, delivery, and erection of 66,000-V and other cables for the Mid-East England Electricity Scheme, 1929. (May 23rd.)
June 27th. Pilot cables for the Central England Electricity Scheme, 1928. (June 6th.)
June 30th. Metering equipment in the area of the Central England Electricity Scheme, 1928. (May 30th.)
33,000-V and other cables for the South-East England Electricity Scheme, 1927. (June 6th.)
July 28th. 132-kV transmission line crossing of the River Thames for the South-East England Electricity Scheme, 1927. (See this issue.)
METROPOLITAN WATER BOARD.—June 20th. Supply for 12 months, commencing August 1st, of electric lamps. Form of tender from the chief engineer, at the offices of the Board.

Manchester.—June 18th. Public Health Committee. Heavy a.c. equipment, cables and lighting at new children's sanatorium, Abergele. Specification and form of tender (deposit £1 1s.) from city architect, Town Hall.

June 27th. Electricity Committee. Annual contract for 3-phase 6,600-V switchgear. Supervisory control gear, Cumberland Street sub-station. (June 6th.)

Newcastle-upon-Tyne.—July 14th. Newcastle-upon-Tyne Electric Supply Co., Ltd. Complete boiler-house equipment for the Dunston power station. (See this issue.)

New Zealand.—WELLINGTON.—Public Works Department. July 1st. 110-kV suspension insulators for the Waitaki Power Scheme. (B.X. 6443.)*

August 12th. 11-kV metal-clad switchgear and accessories for Mangahao. (B.X. 6455.)*

August 19th. Supply and delivery of three single-phase transformers for the Penrose sub-station. (B.X. 6427.)

October 7th. 110-kV and 50-kV switchgear and protective system for Arapuni Electric Power Scheme. (B.X. 6450.)* 50-kV switchgear and steelwork for Arapuni. (B.X. 6451.)*

Nottingham.—June 17th. Electricity Department. Supply of general stores for 12 months commencing July 1st, 1930. (May 23rd.)

Oldham.—June 20th. Public Assistance Committee. Supply of electric lamps and fittings to Rochdale Road Institution. Form of tender from Public Assistance Officer.

Oswestry.—June 14th. Electricity Department. Cables, switchgear and transformers. (May 30th.)

Salford.—June 25th. Electricity Department. One 1,000-kVA step down Scott-connected transformer bank, ratio 6,600 V, three-phase, 50 cycles, to 3,130 V, two-phase. Specifications from city electrical engineer, Electricity Department, Frederick Road.

June 30th. City Council. Electric lighting installation for new nurses' home, Hope Hospital. Specifications (deposit £2 2s.), from Public Health Department, 143, Regent Road, Salford.

Scunthorpe and Frodingham.—June 18th. U.D.C. Wiring for electric lighting and power at public baths to be erected in Doncaster Road, Scunthorpe. Specifications and form of tender (deposit £2 2s.) from W. Farrar, engineer and surveyor, Council Offices.

South Africa.—CAPE TOWN.—June 25th. Electricity Department. Supply of single-phase transformers. (B.X. 6378.)*

JOHANNESBURG.—June 19th. Railways and Harbours. Supply and delivery of metal-clad 2,000-V switchboard for sub-station at Bloemfontein workshops. (B.X. 6402.)

July 28th. Twenty-eight electric lifts for the new railway building, Johannesburg. (A.X. 9623.)*

June 26th. Municipal Council. Electricity meters and time switches. (B.X. 6449.)*

Sunderland.—July 7th. Electricity Department. Supply for 12 months ending September 30th, 1931, of cable, wire, meters and lamps. (June 6th.)

Warsop and Blackwell.—June 24th. Rural District Council. Electric motors and equipment in duplicate at main pumping house, Warsop (contract No. 4); electric mains and equipment in duplicate at booster station (contract No. 7). Specifications (deposit £2 2s. each contract) from Elliott and Westwick, Gilcroft Chambers, Church Lane, Mansfield.

Westmeath.—June 26th. County Council. Electrical installations at County Buildings, Mullingar, and courthouses at Mullingar, Athlone, Moate and Kilbeggan. Specifications from Messrs. J. P. Tierney & Co., consulting engineers, 44, Kildare Street, Dublin.

Wolverhampton.—June 17th. West Midlands Joint Electricity Authority. Double circuit 33,000-V overhead transmission line supported by steel towers. (May 30th.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.

Contracts Closed.

Brecon.—Town Council. Accepted :—
One 75-kW generating set and accessories (£1,763).—Petters, Ltd.

Chesterfield.—Town Council. Accepted :—
800 yards of h.p. cable (£202).—Macintosh Cable Co., Ltd.
Transformer sub-station equipment (£242).—Yorkshire Switchgear and Engineering Co.
Spare 150-kVA transformer (£120).—Brush Electrical Engineering Co., Ltd.

Dartford.—Electricity Committee. Recommended :—
Cable (£441).—Hackbridge Cable Co., Ltd.
Feeder pillar (£53).—Johnson & Phillips, Ltd.

Dewsbury.—Town Council. Accepted :—
The tender of Edison Swan Cables, Ltd., supply of 1-in. and 0.6-in. rubber cables (£351).—Edison Swan Cables, Ltd.
Supply of 4-in. and 0.2-in. rubber cables (£63).—G. Crowther.

Dumfries.—Town Council. Accepted :—
The tender of the Metropolitan-Vickers, Ltd., for a steel switch and transformer kiosk (£182).—Metropolitan-Vickers Electrical Co., Ltd.

Epsom.—Urban District Council. Accepted :—
Supply of electric lamps for 12 months.—Siemens Electric Lamps and Supplies, Ltd.

Gainsborough.—Urban District Council. Accepted :—
For cables.—Pirelli-General Cable Works, Ltd.

Hull.—Education Committee. Accepted :—
Electric lighting installation at Technical College (£1,805).—City Electrical Engineering Co. (Hull), Ltd.
Electricity Committee. Accepted :—
Make-up pump for cooling tower (£133).—English Steel Corporation, Ltd.

Leeds.—Electricity Committee. Accepted :—
Cables.—Macintosh Cable Co., Ltd. (£4,278); W. T. Henley's Telegraph Works Co., Ltd. (£4,127); Enfield Cable Works, Ltd. (£1,490); Croydon Cable Works, Ltd. (£1,465); Hackbridge Cable Co., Ltd. (£1,330).

London.—SOUTHWARK.—Electricity Committee. Recommended :—
Replacement of battery switches (£136).—Record Electrical Co., Ltd.

Oldham.—Electricity Committee. Accepted :—
L.p. cable.—Union Cable Co., Ltd.

Rotherham.—Electricity Committee. Recommended :—
Cable (£332).—Callender's Cable & Construction Co., Ltd.
Switchgear at Technical College sub-station (£426).—Ferguson, Pailin, Ltd.

South Shields.—Electricity Committee. Accepted :—
One group of 1,250-kW Scott-connected transformers (£845).—British Electric Transformer Co., Ltd.

Stoke-on-Trent.—Electricity Committee. Accepted :—
Replating battery at Stoke sub-station (£625).—Tudor Accumulator Co., Ltd.
Erection of overhead lines for 12 months.—Craven and District Electrical Construction Co., Ltd.

Forthcoming Events.

World Power Conference.—Berlin. June 16th to 25th.

Association of Mining Electrical Engineers.—June 24th to 28th. Annual convention in London.

Electrical Contractors' Association.—Llandudno. June 25th to 27th. Annual convention.

Physical Society.—Friday June 13th. Imperial College of Science, South Kensington, S.W.7. 5 p.m. Short papers and a demonstration.

Royal Institution.—Friday June 13th. Institution, 21, Albemarle Street, W.1. 9 p.m. "Unemployment." Prof. H. Clay.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We shall be glad to learn the names and addresses of makers of the following devices :—

"PYLE-O-LITE" floodlighting units and equipment.

"BIRUM" vacuum cleaner.

"The Empress of Britain."

The *Empress of Britain*, the Canadian Pacific Railway Company's new luxury liner, which was to be launched by H.R.H. the Prince of Wales—the Master of the Mercantile Marine—on Wednesday, June 11th, will have a speed of over 24 knots. She will accommodate 1,100 passengers, and will be able to complete the journey between Southampton and Quebec in five days. Her gross tonnage will be 42,000.

The electrical installation will consist of 3,550 kW. of generating plant; there will be 10,000 lamps and a manual automatic telephone exchange system throughout the ship, and all cooking and heating will be electrical. A radio telephone system for speaking from ship to shore and for receiving telephone messages back again will be installed.

The whole of the rubber-insulated cables are of Henley's manufacture. The *Empress of Britain* was built on the stocks at the shipyard of John Brown & Co., Clydebank.

Notes.

The Faraday Centenary.

We have received a report on the progress made with the arrangements for the celebration, next year, of the centenary of Faraday's discovery of electro-magnetic induction. Particulars of the arrangements will be found on p. 1133. We have received the following letter from Mr. F. W. Purse which has a bearing on the same subject:—

"At the present moment we are in the throes of our annual series of conventions, and doubtless some consideration will be given as to the venue for the meetings next year. A National Convention has been suggested before, and I am fully conscious of the many difficulties. But next year we shall be celebrating the centenary of one who conquered greater difficulties and made our profession and industry what they are to-day. Is it beyond us for once in a century to plan a great 'get together,' surmount all the difficulties and have a wonderful electrical convention worthy of the position this glorious country of ours occupies in the electrical world?

"Our parent body, the 'Institution,' has given a splendid lead in voting a sum up to £10,000 for the purpose of organising a scientific exhibition devoted to the work of Faraday. What better start could there be? Let all the other associations rally round the I.E.E and plan their meetings next year to form part of a great and glorious Faraday Celebration Week. The Americans stole a march on us in their Edison Light Week—let us go one better and show the world what it owes to Faraday and how much we honour his great name and works.

"Prompt, united action is necessary! Can we rise to the occasion?"

Rural Supply at Winchester.

The inauguration ceremony of the scheme of the Winchester Corporation Electricity Department to supply with electricity the parishes of Twyford, Compton and Shawford was held at Twyford on May 21st, when Alderman Johnson, chairman of the Winchester Electricity Committee, presided, supported, among others, by the city electrical engineer, Mr. R. Ayton, M.I.E.E. The chairman explained briefly the difficulties that had been encountered in carrying out the scheme, and the efforts which had been made to preserve the amenities of the district. He asked Mr. Maylett to convey to his firm, Messrs. W. T. Henley's Telegraph Works Co., Ltd., the satisfaction of the Committee at the way the contract had been carried through, and expressed the hope that the residents would make abundant use of the current and so enable the Committee, not only to retain the present tariffs, but possibly to consider a reduction in the near future. The Mayor, Councillor H. Collis, closed a switch making the supply available to the residents, and at the same time the Parish Hall was brilliantly illuminated and a large electric sign read "Twyford and Compton Electricity Supply On." Mr. Maylett presented to the Mayor, on behalf of his company, a handsome silver electric table lamp with an ornamental shade as a memento of the occasion. For the purpose of this rural electrification scheme energy is purchased in bulk from Southampton Corporation, which delivers it at 11,000 volts, 3-phase, 50 cycles, to a switching and metering kiosk supplied by the English Electric Co., Ltd., situated at the southern extremity of the Winchester supply area. From this point the current is transmitted by overhead line to the outskirts of Twyford, whence it is carried by underground cable to two transformer kiosks, also supplied by the English Electric Co., Ltd., situated in Compton and Twyford, respectively. These kiosks are provided with oil switches with overload and leakage trips, isolating switches, low-pressure distribution units of "Henley" manufacture, and 100-kVA transformers, though space has been allowed for the installation of 300-kVA transformers when they are warranted by the growth of the load. Low-pressure distribution is 4-wire, 3-phase, 230-400 volts, and is carried out generally by overhead lines, though in some cases it has been necessary to lay underground cables. The whole of the overhead work was carried out by Messrs. W. T. Henley's Telegraph Works Co., Ltd., h.p. and l.p. cables were supplied by the Enfield Cable Works, Ltd., and the laying and jointing was done by the Winchester Electricity Department.

Physics in Wireless.

"The Influence of Physical Research on the Development of Wireless" was outlined in the presidential address of Dr. W. H. Eccles, F.R.S., M.I.E.E., before the Institute of Physics, which, it will be recalled, was incorporated in 1920 in order to form into a professional body all physicists interested in industrial applications. Until nearly the end of the 1914-18 European war physicists who were occasionally called upon to enter the service of the State were officially classed as "chemists," and those who entered industry did so in the guise of "engineers." The stability which the Institute had attained after a life of ten years showed that its founding was justifiable. The purpose of the presidential address was to show that the physicist had already proved his value in industry, and the subject of wireless telegraphy and telephony was chosen as an illustration of the constructive work of physicists in typical modern enterprise. At present the industrialists were indulging in profound self-examination and there was much discussion of the process called "rationalisation," the main object of which was to reduce the costs of production and operation in important industries; its aspects were multitudinous, but, keeping to the technological side, an important instrument of rationalisation was standardisation, and another was the modernisation of plant and products by the introduction of the latest invention and knowledge. However, standardisation was opposed to modification, and the conflict had not yet been thoroughly discussed. To put the matter in another way, it was not economic to standardise machinery or products too soon; that was, before the latest improvements had been incorporated, and it was not economic to modify a standardised form until the cost of adopting it had been recovered. The conflict was well illustrated in the history of wireless and unceasingly appeared in many industries, such as the electrical industry, and therefore the physicist was deeply concerned in it. To those responsible for making decisions it was no easy task to settle when to introduce improvements and when to stop improving in order to standardise. The physicist was probably regarded as the villain of the piece; for he had been, in certain industries, the cause of many a sudden change of direction, the source of many a revolutionary idea. But the better view of the position of the physicist was that he possessed potentialities for helping as well as for disturbing the stability desirable even in progressive motion; being intimately connected with the laboratories whence sprang the sort of invention that shattered established technique, he was better equipped than others to forecast in some degree the direction of forthcoming change and to assist in deciding the instant and mode for standardising and modifying.

Emissions from Power Stations.

The Electricity Commissioners have appointed a committee to consider and report upon the measures which have been taken both in this country and in others to obviate the emission of soot, ash, grit, and gritty particles from the chimneys of electric power stations. The committee, which held its first meeting on June 2nd, consists of the following: C. D. Taite, Esq., M.I.E.E. (Chairman); M. H. Adams, Esq., M.I.Mech.E.; Councillor H. K. Beale; J. Bruce, Esq., A.M.I.E.E.; A. N. East, Esq., M.I.E.E., A.M.I.Mech.E.; Bailie A. Holmes; W. Innes, Esq., M.I.E.E.; A. B. Owles, Esq.; S. L. Pearce, Esq., C.B.E., D.Sc., M.Inst.C.E.; T. Roles, Esq., M.I.E.E.; W. C. P. Tapper, Esq., M.I.E.E.; Alderman W. Walker, M.I.E.E.; E. R. Wilkinson, Esq., A.M.I.E.E.; Mr. C. S. Jenkins as Secretary.

Short X-rays.

The London Hospital, Whitechapel, E., is to spend £5,000 on the installation of new X-ray treatment apparatus for the production of rays of very short length, akin to radium rays.

Substitutes for Steam.

Mercury was the first substitute for steam to be tried and it has proved acceptable under certain conditions. According to the *Electrical World* other substitutes may be found in diphenyl and diphenyloxide. These hydrocarbons can be made cheaply and in volume if the demand is created.

Diphenyl is a solid at ordinary temperatures, with a melting point of 69 deg. C. and a boiling point of 255 deg. C. It has no perceptible corrosive action on metals and is stable at high temperatures. At a temperature of 371 deg. C. diphenyl has a pressure of only 124 pounds absolute, compared to 725 pounds for steam, and contains twice as much disposable heat energy as an equal weight of steam. Diphenyloxide melts at 27 deg. C. and boils at 260 deg. C.; it has a critical temperature at 532 deg. C. at a pressure of 520 pounds absolute.

They both have non-poisonous vapours and many desirable characteristics. They can be made as by-products in the petroleum industry from benzol and are worthy of study as heat carriers, heat transfer agencies, and even for direct use in power generation.

Appointments Vacant.

Visiting teacher and assistant visiting teacher at the Paddington Technical Institute for the London County Council.

Electrical engineer in connection with the Kano Water and Electric Light Schemes in Nigeria for the Crown Agents for the Colonies.

Manager for East Retford Electricity Department.

Lecturer for the Manchester Municipal College of Technology.

Combustion engineer for the Battersea Borough Council.

(See our advertisement pages to-day.)

"Volta" Institution.

The deed transferring the sum of 8,100,000 lire (£88,000) given by the Edison Company for the creation of an institution named after Volta, the famous electrician, was signed at the Palazzio Venezia on June 6th in the presence of Signor Mussolini. The sum is to be the nucleus of the "Alessandro Volta Foundation," which will be linked with the Italian Academy, the object of which will be to promote annual meetings of experts to discuss the principal problems of science, physics, mathematics, letters, arts and travel, and the improvement of the organisation of scientific expeditions.—*Reuter.*

Consumption of Electricity in 1929.

Returns rendered to the Electricity Commissioners show that the amount of electricity sold to consumers by authorised undertakers in Great Britain in the year ended December 31st, 1929, was 8,596 million kWh, representing an increase of 993 million kWh, or about 13 per cent., on the figure for the previous year.

Comparative figures for the period 1922 to 1929 are set out below. They represent the amount of electricity retailed direct to consumers, and are exclusive of intersales in bulk between authorised undertakers.

Year.	kWh sold to consumers. Millions.	Increase on previous year. Actual Millions.	Per cent.
1922	3,645	—	—
1923	4,329	694	19.0
1924	4,998	659	15.2
1925	5,515	517	10.3
1926	5,724	209	3.8
1927	6,850	1,126	19.6
1928	7,602	752	10.9
1929	8,596	993	13.0

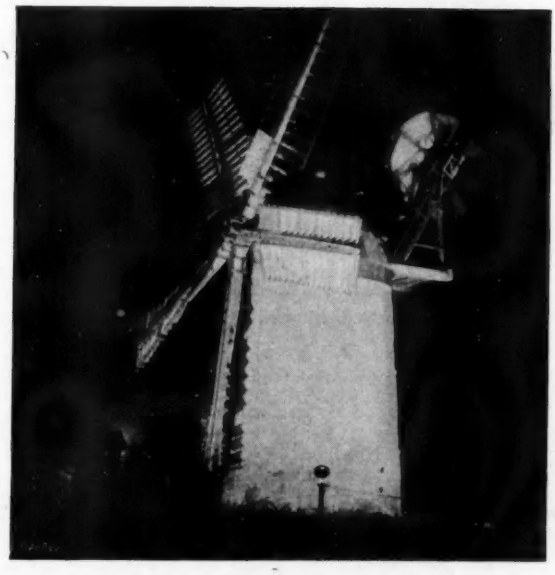
Geographically the increase is accounted for as under:—Undertakers in England, 889 million kWh, or 13.6 per cent.
Undertakers in Scotland, 60 million kWh, or 7.5 per cent.
Undertakers in Wales, 44 million kWh, or 18.1 per cent.
The last figure includes sales in England by the North Wales Power Company.

The S.W.S. Co.'s Rural Campaign.

An intensified campaign of propaganda throughout its rural areas is to be conducted by the Shropshire, Worcestershire, and Staffordshire Electric Power Co., with the dual object of advancing the uses of electricity in small domestic dwellings and on farms. Approximately 200 villages are already served by the company's supply mains, and this number will be considerably augmented during the next few months. Exhibitions are to be held in a large number of villages, and at the leading agricultural shows and floral fêtes throughout the area. The campaign will conclude in September at Abergavenny, where the company has recently commenced operations. In connection with the efforts to interest farmers, the company is conducting experiments with a new rotary tiller for which special advantages over the ordinary plough are claimed. Operated by one man from an electric motor, with a trailing cable, it prepares the ground fully for the seed, and though the experiments are not yet completed, it is evident that the tiller may be offered as an economical proposition. Chaff-cutters, root-pulping machines, saw benches, and other electrically-operated equipment of interest to farmers and to those engaged in small rural industries will be demonstrated throughout the summer.

A Floodlighted Windmill.

The move towards the preservation of old windmills renders a recent development at Nuneaton of particular interest. Tuttle Hill Windmill, one of the most picturesque landmarks

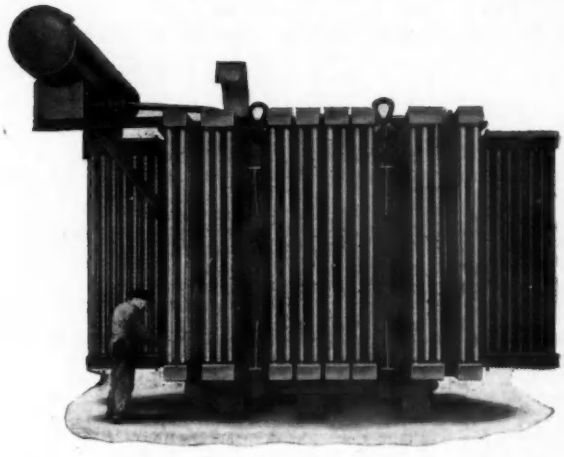


Tuttle Hill Windmill, Floodlighted.

in the Midlands, has, according to the *Osram G.E.C. Bulletin*, been floodlighted as the result of the efforts of Mr. S. Cameron Gibson, engineer and manager of the Nuneaton electricity undertaking, in carrying out floodlighting experiments in connection with various local buildings. For this installation G.E.C. F.B.2505 and I.E.2/86 units are employed, using 1,000- and 500-W lamps, respectively.

A Large Transformer Tank.

The accompanying illustration shows a large transformer tank manufactured for the grid scheme of the Central Electricity Board for South-East England constructed to special design by Messrs. G. A. Harvey & Co. (London), Ltd., and is fitted with their "Harco" pattern gilled tubes for cooling purposes. The tank, the first of a number on hand, is for a 15,000-kVA, 132,000-V, 50-cycle, three-phase transformer. The "Harco"



15,000-kVA Transformer Tank Fitted with "Harco" Gilled Tubes.

gilled tubes are of mild-steel, they weigh considerably less than cast-iron ones, and, it is claimed, cannot crack or break when subjected to variations in temperature. Greater efficiency is obtained owing to the inner edges of the gills being crimped during the operation of fixing, with the result that the surface of contact with the tube is increased, as well as the radiation area. One of the tubes dissipates as much heat as three plain tubes, thus trebling the natural cooling possible. The batteries of tubes can be detached without emptying the oil from the tank, owing to the fact that special valves are provided, which, when closed, isolate the radiator from the tank, when it can be drained of oil and removed. The chief object in having these radiators detachable, however, is to make transport from the works to the site possible by their removal. The tubes can be manufactured to withstand pressures up to 700 lb. per sq. in., and batteries can be supplied to specification.

The Theory of Artificial Lines and Filters.

In the review of the book bearing the above title, which appeared in the ELECTRICAL REVIEW of May 23rd, the author, Mr. A. C. Bartlett, was referred to as an American. Mr. Bartlett is of British nationality.

Institution of Electrical Engineers.

COUNCIL NOMINATIONS.—The Council has nominated the undermentioned gentlemen to fill the vacancies which will occur on September 30th next:—*President*: Mr. C. C. Paterson; *vice-president*: Mr. R. K. Morcom; *hon. treasurer*: Mr. E. Leete; *new members of Council*: Messrs. F. W. Crawtee, A. Ellis, E. W. Hill, W. Riggs, R. P. Sloan, R. Grierson, and J. F. W. Hooper.

METER AND INSTRUMENT SECTION.—*Chairman*: Mr. E. Fawssett; *new members of Committee*: Dr. C. V. Drysdale, Messrs. F. A. East, E. W. Hill, W. Holmes, and W. Lawson.

WIRELESS SECTION.—*Chairman*: Mr. C. E. Rickard; *new members of Committee*: Messrs. G. W. N. Cobbold, B. E. G. Mittell, E. H. Shaughnessy, G. Shearing, and L. B. Turner.

NORTH-WESTERN CENTRE.—The Committee's annual report for the 1929-30 session shows that 9 ordinary and 5 other meetings were held, at which the average attendance was 122, against 108 during the previous year; the number of speakers who took part in discussions was 46 for 9 meetings, compared with 75 for 9 meetings the year before. The attendance at the smoking concert was 150 and at the annual dinner 267. The membership increased by 60 to 1,172. The officers for the 1930-31 session are:—*Chairman*: Mr. A. L. Lunn; *vice-chairmen*: Messrs. L. Romero and G. F. Sills; *new members of Committee*: Messrs. R. Brooks, G. A. Cheetham, J. L. Carr, A. G. Ellis, S. Ferguson, J. F. Fletcher, A. E. Jipson, T. A. Kerr, E. C. McKinnon, G. G. L. Preece, G. L. Porter, and T. W. Ross; *hon. secretary*: Mr. J. W. Thomas.

N.-W. STUDENTS' SECTION.—During the 1929-30 session 13 meetings were held, 3 works visits, a concert and a dance. The average attendance was 52.4 at meetings and 36.6 at visits, while the average number contributing to discussions was 8.75. Two premium awards for papers were secured.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

Mr. T. H. U. Aldridge, M.I.E.E., M.I.Mech.E., Fel. A.I.E.E., as briefly announced in our last issue, has, after 29 years spent with the Shanghai Municipal Electricity Department and the Shanghai Power Company, returned to this country and will make London his permanent headquarters. He went out to Shanghai Electricity Department in March, 1901, as municipal electrical engineer, at the age of 27 years, and joined two foreigners and 200 Chinese who comprised the staff. The generating plant capacity was then only 550 kW. When he left for home in February last he was able to state that not only had the Riverside station grown to 161,000 kW, but there was another 50,000 kW coming along shortly. The foreign staff had increased to over 300 and the Chinese to over 3,000. It will be remembered that last year the Department was sold to the Shanghai Power Co., formed by the American & Foreign Power Co., a subsidiary of the Electric Bond & Share Corporation, for Tls. 81,000,000, twice the actual book value of the plant at the time of the sale. Mr. Aldridge during his lengthy period there had been principally responsible for the development of the Department as engineer-in-chief and general manager, and at the time of the sale it was contributing some ten per cent. of the Shanghai Council's revenue. By providing cheap power the Department greatly facilitated the introduction and development of industrial enterprises with which the district bristles and that the purchasers had great faith in the future is evident from the large sum paid for the undertaking. Various presentations were made to Mr. Aldridge before leaving. The Chinese community, on February 13th, presented him with a beautiful gold incense burner following a farewell presentation made by the staff on the previous day. On February 14th the executive staff of the Shanghai Power Co., presided over by Mr. C. S. Taylor, gave a farewell tiffin at the Shanghai Club and made a further presentation. Some 180 members of the company's staff and their guests assembled at the Astor House Grill Room on February 12th to bid farewell to Mr. Aldridge. The first part of the evening was devoted to a musical programme, and during the interval Mr. Aldridge was presented by the staff with an English silver cigar box, suitably engraved, and a leather-bound volume of parchment in which were inscribed the signatures of the whole of the staff. Mr. C. S. Taylor, who has succeeded Mr. Aldridge as vice-president and general manager of the Shanghai Power Co., expressed the feelings of the staff concerning Mr. Aldridge's retirement. He said that no-one was better qualified than himself to testify to Mr. Aldridge's consistent attention to staff interests throughout his long connection with the undertaking. He was ever ready to temper the wind to the shorn lamb. Mr. Taylor went on to refer to Mr. Aldridge's great achievements. Mr. Aldridge expressed, in reply, his appreciation of the loyal assistance of his former colleagues. He could never forget the help that they had given him—especially the executive men who had in the nature of things been in close touch with him. He knew that their interests would be looked after under the new régime under Mr. Taylor. Naturally the interests of the company must come first, but inter-related to those interests and forming part of them were the welfare and happiness of the staff, and they had his assurance that Mr. Taylor would carry out his policy of doing what he could on their behalf consistent with the business for which he was responsible. We published a photograph of Mr. Aldridge in our issue of February 7th last.

Mr. Henry Mozley, the late manager of Burnley Tramways and Omnibuses, was recently presented with a grandfather clock by the Lancashire and Cheshire Tramways and Transport Managers' Association. Mr. R. S. Pilcher, manager of Manchester transport undertaking, made the presentation and referred to Mr. Mozley's service, especially as president of the Association in 1916-17. Mr. Mozley said he had been connected with transport since 1868, and could survey in retrospect 62 years of change and progress. There was no general demand for the abolition of tramways in Burnley.

Mr. J. N. Waite, Hull city electrical engineer, has written to the Electricity Committee applying for a testimonial to be used in applying for the position of chief engineer and manager of a municipal electricity undertaking, which was advertised at a commencing salary of £1,750 per annum, subject to the scale of remuneration set up by the Standing Joint Committee of the Incorporated Municipal Electrical Association and the Associated Municipal Electrical Engineers. At a meeting of the Committee, the chairman said that if the scale were in operation at Hull Mr. Waite's salary for this year would be about £2,100. He thought the Committee should be aware of the position. It was decided that as and from the date of termination of his current agreement, *i.e.*, January 14th, 1931, the city electrical engineer's salary should be increased to the scale, subject to Mr. Waite's agreeing to remain in his present position for a period of not less than five years from date, except in the case of an appointment of a national character.

Mr. J. W. Elliott, who is retiring after 44 years' service with the Edison Swan Electric Co., Ltd., was entertained at dinner by the directors and management of the company at the Piccadilly Hotel on May 23rd. The chairman of the company, Mr. Charles F. Spencer, presided, and in proposing the toast of the guest of honour, referred to the amazing electrical developments which had taken place since Mr. Elliott joined the company in 1886. He said that Mr. Elliott would take with him in his retirement the good wishes of a great many friends in the electrical industry. Speeches supporting the toast were made by Mr. E. A. Gimmingham, Mr. C. H. Cox, and Mr. F. V. Hasemore. On behalf of the directors and management the chairman then presented Mr. Elliott with a silver tea and coffee service, and a handbag for Mrs. Elliott as a souvenir of the occasion. In his reply Mr. Elliott sketched the development of the electric lamp and valve industries, and expressed his regret at severing the many excellent friendships which he had formed both amongst the members of the staff and amongst the trade. Mr. Elliott was one of the prime movers in the formation of E.L.M.A., and he has been on many occasions chairman of the Sales Committee. His experience of the electric lamp industry commenced when Sir Joseph Swan started the first factory equipped to produce electric lamps on a commercial basis. Mr. Elliott has also been chairman of the B.R.V.M.A. on several occasions. Another presentation was made to Mr. Elliott at the Ponders End works of the company in the form of a chiming clock, a gift from the staff.

Howard Coster] [*London.*

Mr. J. W. Elliott.

Who is retiring after 44 years with the Edison Swan Company.

Mr. Henry Savage has retired from the position of manager of the North Woolwich works of Messrs. W. T. Henley's Telegraph Works Co., Ltd. He announced his impending retirement at the annual staff dinner in March, as we reported at the time. On Wednesday last week he was presented with an epidioscope and a pocket wallet, while Mrs. Savage received a fitted leather dress case and a writing case subscribed for by the staff of the company and the workpeople of the North Woolwich works. **Mr. Ernest Lefeaux**, assistant works manager, has been appointed to succeed Mr. Savage as manager.

Mr. W. Taylor, has been appointed by the Southport Town Council to the position of electrical showroom manager for a year, at a salary of £230, the appointment to be confirmed after that period on satisfactory service at £256 per annum.

Mr. C. H. Rayner, sales manager of the Manchester Corporation Electricity Department has been appointed chairman of the Manchester branch of the Incorporated Sales Managers' Association.

Major J. T. Rodwell, O.B.E., A.M.I.E.E., of the Cordoba Central Railway, is home on leave from Argentina.

Sir William Bragg has been elected a corresponding member of the Vienna Academy of Sciences.

Mr. G. B. Sansom, C.M.G., has been promoted from Commercial Secretary to Commercial Counsellor at Tokyo.

Mr. A. H. Dykes has been appointed chairman of the Committee of the Association of Consulting Engineers. **Mr. S. R. Raffety** is to act as honorary secretary during Mr. Dykes's term of office.

Mr. W. R. Herod, secretary of the General Electric Co. of America, is visiting Australia and New Zealand studying the electrical field as it will be affected by the new Australian tariff.

Mr. Bernard Price, general manager and chief engineer of the Victoria Falls and Transvaal Power Co., Ltd., has arrived on a visit to England.

Mr. Barnes Kay, municipal electrical engineer of Haslingden, we regret to learn, was taken seriously ill whilst attending the I.M.E.A. Convention at Eastbourne. The Haslingden Town Council has passed a resolution of sympathy with him.

Mr. R. A. Chattock writes to say that he has now taken up a permanent residence in London. His address is 14a, Marlborough Place, St. John's Wood, N.W.8. (Telephone: Maida Vale 3710.)

Obituary.

Mr. J. E. Raworth.—We regret to record that Mr. John Ernest Raworth, F.C.I.P.A., who founded the business of John E. Raworth & Moss, chartered patent agents and consulting engineers, 25 years ago, passed away on May 4th. Mr. E. W. Moss, F.C.I.P.A., M.I.Mech.E., A.M.I.E.E., F.C.S., who has been a partner for the past twelve years, will carry on the business at 75, Victoria Street, London, S.W.1.

Financial Section.

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares.

New Companies Registered.

John Shaw & Co. (Electrical), Ltd.—Private company. Registered June 2nd. Capital, £1,000 in £1 shares. Objects: To carry on the business of electrical, lighting, heating, radio, mechanical and general engineers, engineering contractors and factors, manufacturers of and dealers in telephones, batteries, dynamos, accumulators, motors, electrical apparatus, &c. The first directors are: J. S. Shaw, 46, Cranbrook Avenue, Hull, electrical engineer; T. Oldridge, 34, Lonsdale Street, Hull, secretary; J. W. Gould, 95, Etherington Road, Hull, electrical engineer; W. A. Kelley, and J. L. P. Pinkney, addresses not stated (all permanent).

Pauline Radio, Ltd.—Private company. Registered May 31st. Capital, £1,000 in £1 shares. Objects: To acquire the business of a radio-telegraphy engineer and dealer in apparatus and accessories appertaining thereto now carried on by C. H. Pauline at 791, Christchurch Road, Boscombe, Bournemouth, as "Radic House." The permanent directors are: C. H. Pauline, 791, Christchurch Road, Boscombe, Hants, electrical engineer; F. C. Jameson, 117, Richmond Park Road, Bournemouth, electrical engineer. Solicitor: G. T. Richards, 209, Seabourne Road, West Southbourne, Hants.

Frank Angell & Co., Ltd.—Private company. Registered May 31st. Capital, £1,000 in £1 shares. Objects: To carry on the business of electrical and mechanical engineers, metal merchants, ironmasters and founders, engineers and contractors, suppliers of electricity, manufacturers of and dealers in wireless apparatus and materials, &c. The subscribers (each with one share) are: F. Angell, 75, Rosebery Road, Muswell Hill, N.10, engineer; A. Wilson, 62, Myddelton Square, E.C.1, clerk. F. Angell is permanent governing director. Solicitors: Zeffertt & Heard, 17, Coleman Street, E.C.

Hustler, Simpson & Webb, Ltd.—Private company. Registered June 5th. Capital, £11,000 in 10,000 10 per cent. cumulative preference shares of £1 each and 20,000 ordinary shares of 1s. each. Objects: To carry on the business of manufacturers, importers and exporters of, and dealers in wireless, electrical and scientific apparatus and appliances, gramophones, cabinets, advertising signs and appliances, &c. The directors are: Ivor W. E. Hustler, 30, Spring Park Road, Shirley, Surrey; D. Simpson, "Brading," The Ridgeway, Westcliff-on-Sea; R. A. Webb, 26, Marine Parade, Leigh-on-Sea; A. Barker, Thorpe View, Barling Road, Southchurch, Essex. Registered office: 55-57, Tanner Street, Bermondsey, S.E.

E. W. Hudson & Co., Ltd.—Private company. Registered June 3rd. Capital, £10,000 in £1 shares (7,000 5 per cent. cumulative preference and 3,000 ordinary). Objects: To carry on business as general and electrical engineers, founders, tool and implement makers, &c. The directors are: E. W. Hudson, 8, West Hill Road, Luton (life director); S. Randall, 149, Tennyson Road, Luton; E. L. Hudson, 17, Cutenhoe Road, Luton, all engineers and manufacturers. Secretary: S. Randall. Registered office: 5 and 7, Langley Road, Luton.

Stewards Electrical Co., Ltd.—Private company. Registered June 3rd. Capital, £2,500 in £1 shares. Objects: To carry on the business of manufacturers and sellers of electrical machinery, instruments and components, &c. The directors are: H. Steward, 13, Surbiton Road, Southend-on-Sea; H. Covill, 4, Edith Road, Southend-on-Sea; G. J. Cooper, 69, Cambridge Road, Teddington. Registered office: 327, Southchurch Road, Southend-on-Sea.

Official Returns of Electrical Companies.

Midland Electric Manufacturing Co., Ltd.—Capital, £187,500 in 75,000 preference and 112,500 ordinary shares of £1 each. Return dated March 11th, 1930. All shares taken up. £85,000 paid on 25,000 preference and 60,000 ordinary shares. £102,500 considered as paid on 50,000 preference and 52,500 ordinary shares. Mortgages and charges, nil.

Crampton & Co., Ltd.—Capital, £2,500 in £1 shares. Return dated March 10th, 1930. All shares taken up. £2,500 paid. Mortgages and charges, nil.

L.E.S. Distributors, Ltd.—Capital, £5,000 in 1,000 preference and 4,000 ordinary shares of £1 each. Return dated September 18th, 1929. 3,750 preference and 750 ordinary shares taken up. £3,750 paid on the preference shares. £750 considered as paid on the ordinary shares. Mortgages and charges, nil.

Wessex Electrical Supplies, Ltd.—Capital, £1,000 in £1 shares. Return dated January 14th, 1930. 172 shares taken up. £172 paid. Mortgages and charges, nil.

Electrical Power Engineering Co. (Birmingham), Ltd.—Capital, £5,000 in £1 shares. Return dated November 19th, 1929. 2,445 shares taken up. £1,100 paid. £1,345 considered as paid. Mortgages and charges, nil.

Metropolitan Electric Cable & Construction Co., Ltd.—Capital, £75,000 in 10s. shares. Return dated March 7th, 1930. 120,000 shares taken up. £59,900 paid. £100 considered as paid. Mortgages and charges, nil.

Wholesale Electric Supply Stores, Ltd.—Capital, £2,000 in £1 shares. Return dated December 31st, 1929 (filed April 24th, 1930). 1,002 shares taken up. £2 paid. £1,000 considered as paid. Mortgages and charges, nil.

E. O. Walker & Co., Ltd.—Capital, £3,000 in £1 shares. Return dated December 10th, 1929. 1,150 shares taken up. £1,150 paid. Mortgages and charges, nil.

British Electrical Instruments, Ltd.—Satisfaction in full on May 21st, 1930, of debenture dated August 30th, 1929, and registered September 3rd, 1929, securing £400.

S. G. Leach & Co., Ltd.—Satisfaction in full on May 1st, 1930, of debenture dated December 3rd, 1928, and registered December 14th, 1928, securing £3,000.

Malay and Eastern Power Development Co., Ltd.—Charge on a grant and two certificates relating to lands in the district of Kinta, F.M.S., dated April 10th, 1930, to secure all moneys due or to become due from the company to the Chartered Bank of India, Australia, and China not exceeding 10,000 dollars.

City Notes.

Ever Ready Co. (Great Britain), Ltd.

The annual meeting of this company was held on June 2nd, Mr. M. Goodfellow (chairman) presiding. In presenting the report and accounts, *vide* ELECTRICAL REVIEW, May 16th, p. 924, the chairman said that the sales during the year under review showed an increase of 22½ per cent. over the sales of the previous year. Their low stock values and the lower prices at which they had been able to purchase materials for the coming year had enabled them to effect reductions in prices to the consumers of a number of their productions. They had improved their technical and chemical efficiency, and the expenditure on the expansion of the factories and equipment should result in a considerable increase in their powers of production and a considerable advance in their technical efficiency during the coming year. The public use of portable dry batteries had grown continuously during the past 20 years, and he believed that new uses would be discovered as time went on. They had acquired a controlling interest in the capital of two small companies. During the four months ended March 31st last the general trade position did not prevent their own expansion, and for the two months ended May 31st their sales were greater than they were for the corresponding period in 1929. He believed, therefore, that the preparations made for an increased production would result in their doing an increased business during the coming year. The report and accounts were adopted, and at a subsequent extraordinary general meeting a resolution was passed increasing the capital of the company to £1,000,000 by the creation of 1,000,000 ordinary shares of 5s. each to rank *pari passu* with the existing ordinary shares.

Lancashire Electric Light & Power Co., Ltd.

The accounts of this company were abstracted in our issue of May 30th, p. 1040, and the annual meeting was held on June 2nd. Mr. A. Shepherd (chairman), who presided, said that the trading profits of the Lancashire Electric Power Co., in which almost the whole of their resources were invested, showed an increase of nearly £20,000 over those of the preceding year. The principal event of the year was the bringing into commission of the Kearsley station, the first set of which was put into commercial operation in October. The capacity of the three stations—Radcliffe, Padiham and Kearsley—was 162,000 kW. During the year 14 miles of 33,000-V cables were laid, making a total of about 86 miles of underground cable and 27½ miles of overhead mains now provided, while the increase in route length of 11,000-V mains was about six miles, and in the case of the 2/3,000-V mains about three miles. A large amount of l.p. cables had also been laid totalling approximately 38 miles, and over 2,000 new consumers had been connected thereto. The energy sold during the year amounted to 226,618,000 kWh, as compared with 206,608,000 kWh in 1928. A Special Order had been obtained covering a large area between Preston and Chorley, and the mains were being laid this year to deal with this area. During the year they had purchased the whole of the share capital of the Ormskirk Electric Supply Co., Ltd., the object being to provide a nucleus for the development of the district around Ormskirk. An application for a Special Order covering these districts had been approved. The report and accounts were adopted.

Callender's Cable & Construction Co., Ltd.

The accounts for the year ended December 31st, 1929, record a profit of £403,912, as compared with £360,581 in 1928. After providing for depreciation, debenture interest, preference dividends, &c., adding £570,246 brought forward and transferring £238,730 to reserve, there is an available balance of £595,928. It is proposed to pay a final ordinary dividend of 2s. per share, making 15 per cent. for the year, and to carry forward £428,528. For 1928 a similar dividend was paid but in addition there was a 20 per cent. share bonus. The report refers to improvements in plant and methods, including the adoption of powdered fuel for steam raising at Erith. The demand for cables continues to increase and there was an improvement in trade in the later months of 1929. Delay in connection with wayleaves has retarded the progress of the South-East England Grid but the work is now in course of execution. The financial crisis in the United States delayed the expected advance in the Okonite-Callender business but the company finished the year with a substantial credit balance. The results of the purchase of the business of W. T. Glover & Co., Ltd., had come up to expectations. To finance this purchase and the issue of bonus shares last year the ordinary capital was increased from £800,000 to £1,116,000. The reserve, at £800,000, is double what it was this time last year. The workshops of the company are fully supplied with orders, and contracts covering deliveries for several months ahead have been secured. The Anchor Cable Co. has fully shared in this better outlook. It is proposed to alter the company's articles of association to bring them into line with present-day requirements. The meeting is to be held on June 19th.

Electric Construction Co., Ltd.

Presiding at the annual meeting on June 5th, Mr. J. Gray (chairman) in presenting the report and accounts (ELECTRICAL REVIEW, May 30th, p. 1041) said that the financial results of the year under review were not in keeping with the capital invested and the efforts of the management to restore the company's previous prosperity. The general depression in trade had reacted on them severely, a considerable part of their business being drawn from industrial sources. Moreover, competition in the electrical trades had been excessive and prices had ruled which they had frequently been constrained to reject. He wished to state that the recent movement in the price of the ordinary shares was in no way due to advance information as to the nature of the report to be issued, neither was it due to any proposals for the acquisition of the undertaking. The report and accounts were adopted.

Rangoon Electric Tramway & Supply Co., Ltd.

Presiding at the annual meeting on June 4th, Mr. W. A. W. Dawn (chairman), in presenting the report and accounts, said that notwithstanding the trade depression in Burma during the year under review the demand for electricity was satisfactory, the increase in receipts from this side of the business being £12,236, as compared with the previous year. Regarding the tramways, it was anticipated that the reconstruction of the track on concrete foundations would be completed by the end of the next dry season. Plans for an improved car were being prepared and the electrical re-equipment of the existing cars was being pushed forward. There was a slight improvement in the company's omnibus position. The report and accounts were adopted.

Sphere Investment Trust, Ltd.

The accounts of this company were abstracted in our issue of May 30th, p. 1041, and the annual meeting was held on June 6th. Sir G. A. Touche (chairman), who presided, said that so far as the company was concerned an examination of the balance sheet showed that they were in no sense overinvested, but in a liquid condition and able to take advantage of the depressed prices at present prevailing. He condemned the attitude of the Government in leaving in a state of uncertainty the fate of the McKenna and Safeguarding duties, and its policy of taxation. The City was depressed because confidence had been undermined, and men were unwilling to take risks where the lion's share of any gain went to the tax-gatherer. The report and accounts were adopted.

Lisbon Electric Tramways, Ltd.

The accounts for 1929 show a net profit of £178,311 (against £161,399 in 1928). Of this £50,000 has been transferred to general reserve, £15,000 to staff benefit fund and £10,000 to exchange reserve. A final dividend of 4 per cent. is recommended on the ordinary shares, making 7 per cent. for the year (same for 1928), leaving £28,085 to be carried forward. The number of passengers carried increased from 112,874,963 to 118,824,952. The report refers with regret to the death of Mr. L. Breitmeyer, the chairman. Lt.-Col. S. H. Pollen has been appointed to succeed him, and Lt.-Col. V. Vivian has joined the board. Meeting: June 16th.

Madras Electric Supply Corporation, Ltd.

The net profit for 1929 was £65,868 (against £65,934 in 1928). A final dividend of 5½ per cent. is recommended on the ordinary shares, making 8 per cent., free of tax, for the year. A balance of £7,444 is carried forward.

The profit of the tramway company, after providing for debenture interest, &c., and including an amount brought forward was £10,444. The preference dividend is paid and £4,444 is carried forward.

Electric Supply Corporation, Ltd.

The net revenue for 1929 was £55,901. The final dividend on the ordinary shares is 7 per cent., making 11 per cent., less tax, for the year, the carry forward being £20,415. The undertaking at Exmouth was disposed of as at January 1st, 1929, but the actual transfer was delayed until April last. The company has disposed of its interest in the Wellington company, and invested the proceeds. The energy sold fell from 11,627,623 to 10,556,881 kWh, but the latter figure excludes the Dollar, Jedburgh, and Exmouth undertakings.

English Electric Co., Ltd.

It is announced that under the company's reorganisation scheme Sir Charles E. Ellis, Sir John A. F. Aspinall, and Lt.-Col. Sir John H. Mansell have resigned from the board, and that Mr. F. Massingberd Rogers (managing director, Greater London and Counties Trust), Sir Edward Hilton, M.P., Mr. P. Horsfall (Lazard Bros. & Co.), and Col. W. H. Hayes (Chase Securities Corporation) have been appointed directors. Mr. W. L. Hichens (chairman), Lord Meston, Mr. P. J. Pybus, and Mr. V. Watlington (managing director) remain on the board.

International Telephone & Telegraph Corporation.

The report for 1929 shows that the consolidated net income was $1,773,215,889, an increase over 1928 of $313,582,198, and the net earned surplus increased by $658,302,969, while the total earned and capital surplus amounted to $7,646,557,616. Outstanding shares on December 31st totalled 5,858,785 with no par value, as compared with 1,422,785 shares par value of $100 for the previous year. The Corporation has branches in 47 countries.

Barcelona Traction, Light & Power Co., Ltd.

The report for the year ended December 31st last shows a net revenue of $2,905,037, as compared with $2,759,674 in the previous year. A dividend of 1 per cent. is paid on the ordinary shares, and $1,159,099 (including $413,159 brought forward) is carried forward. A dividend of 1 per cent. was paid in March last on the ordinary shares.

A dividend of 50 cents per share has been declared on the ordinary shares of no par value. In future, if the position of the company permits, dividends are to be paid three times a year.

Penarth Electric Lighting Co., Ltd.

The net revenue for 1929 was £12,065, and after deducting expenses, debenture interest, &c., and adding £3,022 brought forward, there is a balance available of £8,542. The directors propose to place £4,000 to reserve, and pay a dividend on the ordinary shares of 7½ per cent., leaving £2,317 to be carried forward.

Bahia Tramway, Light & Power Co.

The debenture-holders' trustees state that they have received payment in respect of the first promissory note of the State, due on May 28th last. When the necessary authority of the Court is obtained it is hoped to make a distribution of from 10 to 14 per cent. of the face value of the bonds.

Ruston & Hornsby, Ltd.

The profit for the year ended March 31st last was £98,639, as compared with £150,980 for 1928-29. In view of the adverse state of trade at home and abroad, the directors are unable to recommend the payment of an ordinary dividend. Last year 2½ per cent. was paid.

Boston & District Electric Supply Co., Ltd.

The report for 1929 shows that after deducting interest on temporary loans, £7,757 is available. Of this £2,200 is placed to depreciation reserve, £2,690 to renewals reserve, and it is proposed to pay a dividend of 4 per cent., leaving £600 to be carried forward.

Worcester Electric Traction Co., Ltd.

The total revenue for the year ended December 31st last was £5,936. After deducting expenses, &c., and adding £2,144 brought forward, £7,265 is available. A dividend of 5 per cent. is recommended on the ordinary shares, leaving £2,495 to be carried forward.

English Electric Co. of Canada.

The profit for the year ended December 31st last was $340,830. After deducting depreciation allowance and adding the amount brought forward there is a balance of $420,096.

Shawinigan Water & Power Co.

A dividend has been declared on the common shares of $½ per share for the quarter ending June 30th.

Greenwood & Batley, Ltd.

A final dividend of 2½ per cent. is recommended, making 5 per cent. for the year (as for 1928-29).

Stocks and Shares.

TUESDAY EVENING.

NOBODY, and least of all a Stock Exchange member, expected activity to develop in the markets during Whitsun week. The glorious weather atoned for the bleakness of Easter, and tempted an extension of leave on the part of those who were in a position to take it. With Stock Exchange markets in their present stagnant state, the calls of the open road and the open air are so much the harder to resist. There has not been even talk of a Bank Rate reduction to arouse debate upon the prospect of improvement in prices. On the contrary, the ultra-cautious now hint at the possibility of money becoming tigher rather than easier, and the "money" stocks have suffered something of a shake-out as some of the weaker bulls hastened to reduce their accounts. General business, on account of the public, is so meagre as to inspire a suggestion that two or three of the large marking-boards in the Stock Exchange should be temporarily removed and replaced by a "Tote."

Cables and Wireless.

The 7½ per cent. "A" ordinary stock of Cables & Wireless had sunk to 40 when it was suddenly run up to 44½ on a report that Sir Basil Blackett, chairman of Imperial & International Communications, Ltd., was likely to make an encouraging speech at the Imperial Press Conference. Sir Basil made his speech, it is true, but there was little in it from which stockholders in Cables & Wireless could derive consolation, and the prices of the stocks fell back as fast as they had rallied. Sir Basil Blackett stated that in spite of a reduction in rates, private as well as Press, the Merger is suffering severely from the effects of trade depression. No less than 85 per cent. of the traffic is commercial, "and recent falls in our revenue are giving us," he admitted, "serious concern." Imperial & International Communications pays the Post Office £250,000 per annum for a lease in this country of the beam stations communicating with other parts of the Empire, and Sir Basil regretted the refusal of the Post Office to co-operate with the Merger in providing the wireless link for the overseas telephone service.

Globe Telegraph & Trust ordinary shares are 1 down, at 19. Marconi Marines have drooped to 36s. 3d., the American sellers continuing to press their shares upon an unwilling market.

American Communications.

It is announced that the American Telephone & Telegraph has obtained a twenty-years' concession from the Rumanian Cabinet. This follows upon the contract lately secured by the same American company from Spain, and upon the recent acquisition of the Constantinople Telephone Company. The price of American "Telandtel" is 8 points down at 230. International Telephone & Telegraphs also are 8 down at 57½. The latter company's annual report shows an increase in net income for 1929 of 62½ million pounds sterling. The Corporation, according to the report, has branches in 47 countries, and employs 95,000 people.

Barcelona Traction.

The Barcelona Traction, Light and Power Company made a profit for 1929 of nearly three million dollars, an increase of about 150,000 dollars. Operating expenses are described, in the just-issued report, as abnormal owing to an unprecedently severe drought. This necessitated a large increase in the consumption of coal, and, also, the purchase of power. Electrification of one of the principal Spanish railways is making progress. The company paid 1 per cent. on its ordinary shares in March last, and 8 per cent. on the participating preference. Steps are now being taken to convert the preference shares into ordinary; the annual meeting will be held in Toronto on the 24th of this month. The price of the common shares is 34½, showing a fall on the week.

Dollar Stocks.

Americans and Latin-Canadians suffered a sharp shake-out over the week-end, when the British Stock Exchanges were closed and the American open. For some little time past, it has become increasingly apparent that Americans were by no means so enthusiastic about their utility and other businesses as was the case even three months ago. Reports of falling trade and unemployment, taken in conjunction with the slump in commodity values, led to nervousness in the stock markets. This culminated in a bad break in Wall Street last Saturday and Monday. Heavy falls are shown. Montreal Light, Heat and Power, after being 130, went back to 124½. Power Corporation of Canada shares have fallen 6 to 80½. Pennsylvania Water and Power shares are 9 lower at 77½. Shawinigan common shed 2, going back to 75. Calgary Power common at 155 shows a loss of 5. Mexico Tramways have fallen to 24½,

and the company's 50-year bonds at 48 are 4 down. The 5 per cent. first mortgage bonds at 67½ are 2½ lower. Mexican Light and Power shares hold their gain of last week. British Columbia Power "A" shares at 41, and the "B" at 20, are both a little lower. Hydro-Electrics have fallen to 44, and International Holdings to 5⅞. Brazilian Tractions at 46¼ are 6 down.

Electric Supply Corporation.

Electric Supply Corporation shares are unchanged at 47s., on the issue of a report which shows an advance of £2,400, to £55,900, in net revenue. The previous dividend of 11 per cent. is repeated, and the company carries forward £20,416, an increase of £3,400. The Corporation has interests in 15 areas, widely-spread throughout the country. Not all of its operating units have yet been able to contribute to the Corporation's profits. The subsidiary companies are mostly taking electricity in bulk from a central source, with the approval of the Central Electricity Board. At the present price of the shares, the yield on the money is about 4¾ per cent., allowing for accrued dividend, the modesty of the return being a measure of the expectation which the future holds for scope in the way of profitable expansion. Reference to our price-lists will show that the yield offered by such shares ranges from 4¾ per cent. to 5½ per cent. on the money.

Equipment and Manufacturing.

Callender's Cable is maintaining its 15 per cent. dividend on the ordinary shares. Last year, the proprietors received a share bonus of 20 per cent., so that the dividend has to be paid on a larger capital. The price of the shares stands at 3⅜. Crompton Parkinson ordinary are 1/16 better at 25s. America has been a seller of Associated Electrical Industries, and the price, at 25s. 6d., is 1s. 6d. down. General Electric ordinary gave way ¼ to 47s. 6d. in sympathy, but the company's 6½ per cent. preference recovered the dividend taken off the price last week. British Aluminiums have receded to 2 1/16. Siemens are ex dividend at 23s. 9d. Telegraph Constructions remain flat. The price is nominally 19½, but business in the shares has been down as low as 18½. British Thomson-Houston preference hardened to 23s. India-Rubber shares fell back 9d. to 9s. 3d., and shares have changed hands down to 8s. 4½d. Ever-Ready dropped to 17s., recovering to 17s. 6d. Iron and steel shares are quiet. Armstrong Securities Company has made a profit, according to the company's first report, of £11,700. Babcock & Wilcox at 56s. 3d. are 1/16 lower. Philips Incandescent Lamps fell 3s. to 60s. Telephone Rentals have gone back to 3s. 3d.

Home Electricity Shares.

Quiet inquiry persists for the pre-ordinary stocks and shares of the London electricity supply group. St. James' and Pall Mall debenture strengthened to 71½. The ordinary shares are easier, however, at 28s. Charing Cross ordinary are 6d. down at 27s. County of London 6 per cent. preference firmed up to 23s. 6d. In the provincial list, Newcastle-on-Tyne 7 per cent. preference are better at 26s. Lancashire Light and Power at 25s. are ex dividend. Northamptons shed 1s., going back to 45s. 9d., and Richmonds at two guineas are similarly lower. Newcastle and Districts regained their loss, and are 25s. 6d. The shares were described here last week as "Manchester and District," but apology has not yet been demanded. British Light and Power drooped to 14s. Scottish Power new shares came on offer at 9d. premium.

English Electric.

It will be within recollection that the English Electric Company made a fresh issue a little while ago, the shares being taken by Messrs. Lazard Brothers. The sequel is to be seen in the announcement that four new directors have been appointed, including amongst them Mr. F. M. Rogers, managing director of the Greater London and Counties Trust. This is the company which controls a large number of electricity supply companies in this country. Lord Birkenhead and several other well-known British statesmen are on the board of the Greater London and Counties Trust. No changes have occurred in the prices of English Electric preference and ordinary shares, which remain at 7s. 6d. and 2s. 9d., respectively.

Home Railways.

District ordinary at 76½, showing a fall of 10s., is the only stock in this group to show a change. Underground income bonds remain steady at 110, and the shares at 23s. The Tramway group is quiescent, and the wonderfully fine weather which prevailed at Whitsun did nothing to stimulate interest, or buying of the stocks and shares, in the companies that dealt with the huge volume of traffic handled during the holidays.

Indian electric tramways and supply shares are not very easy to deal in, but no quotable movements have taken place in the prices. The Madras Electric Supply Corporation has declared a dividend of 8 per cent. tax free, this being for the tenth year in succession. The shares stand at 27s. 6d. The rubber share market is depressed by a dwindling in price of the product that has taken it to the lowest on record.

Share List of Electrical Companies.

Home Electricity Companies.

	Nom.	Approx. Dividend. 1928.	1929.	Price June 10 1930.	Rise or fall	Yield p.c.
	£					
Bournemouth and Poole	1	15	15	57/6	—	5 4 3
Brompton Ordinary	1	8½	8½	26/6	—	5 5 8
Charing Cross Ordinary	1	8½	8½	27/-	-6d.	5 8 8
do. do. 4½% Pref.	1	4½	4½	18/-	—	5 0 0
Chelsea	1	8½	8½	26/6	—	5 5 8
City of London	1	10	10	33/3	—	4 4 6
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	38/3	—	4 3 9
County of London	1	7	10	47/6	—	4 4 5
do. do. 6% Pref.	1	6	6	23/6	+6d.	5 2 2
Edmundson's 7% Pref.	1	7	7	24/6	—	5 14 3
Elec. Supply Corporation	1	11	11	47/-	—	4 13 7
Kensington Ordinary	1	8	8	27/-	+1/-	5 3 8
Lancs. Light and Power	1	7½	7	25/-xd	—	5 12 0
London Electric	1	8½	9	29/6	—	4 15 0
Metropolitan	1	9	10	41/3	—	4 17 0
do. 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Midland Counties	1	6½	7	27/6	—	5 1 10
Mid. Elec. Power	1	15	8	32/-	—	5 0 0
Newcastle-on-Tyne Ordinary	1	6	6	22/6	—	5 6 8
do. 7% Pref.	1	7	7	26/-	+6d.	5 7 8
Notting Hill 6% Pref.	10	6	6	10¾	—	5 11 4
North Met. Elec. 6% Pref.	1	6	6	22/6	—	5 5 9
St. James' and Pall Mall	1	8	8	28/-	-6d.	5 0 0
Scottish Power	1	8	8	29/-	—	5 3 3
South London	1	8½	8½	27/6	—	5 1 10
Urban Ordinary	1	7	7	32/6	—	4 6 2
Westminster Ordinary	1	8½	8½	27/-	—	5 3 8
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	24/6	—	6 2 5
Yorkshire Elec.	1	8	8	33/-	—	4 17 0

Home Rails.

Central London Ord. Assented	Stock	4	4	77	—	5 4 0
Metropolitan	,,	3½	4	66	—	6 1 3
do. District	,,	4	5	76½	-½	6 10 9
Underground Electric	£1	7	8	23/-	—	6 19 2
do. do. Income	Bonds	6	6	110	—	5 9 1

Telegraphs and Telephones

Anglo-Am. Tel. Pref.	Stock	6	6	103½	—	5 16 0
do. Def.	,,	1½	1½	24½	—	6 2 5
Automatic Telephone	1	10	12½	37/6	—	6 13 4
Cables & Wireless 5½ Pref.	Stock	—	5½	89½	-2	6 3 0
do. A 7½ Ord.	,,	—	—	40½	-¼	... ...
do. B Ord.	,,	—	—	19½	—	... ...
Globe Tel. and T. Ord.	10	10	10	19	-1	*5 5 3
do. do. Pref.	10	6	6	11½	—	5 9 1
Great Northern Tel.	10	20	20	90	—	6 13 4
Marconi-Marine	1	12½	15	1 13/16	-⅛	8 5 0
Oriental Telephone Ord.	1	12	12	55/-	—	*4 7 3

Home and Foreign Trams, &c.

Anglo-Arg. Trams First Pref.	£	5½	5½	2⅛	—	9 11 2
do. do. 2nd Pref.	5	6	6	2⅛	—	10 18 2
do. do. 5% Deb.	Stock	5	5	68½	—	7 0 0
British Electric Traction Def. Ord.	,,	5	5	1725	—	... ...
do. do. Pref. Ord.	,,	8	8	126½	—	6 6
Brazil Traction	100	7	8	46	-6	4 7 0
Brit. Columbia Elec. Rly. Pcc.	Stock	5	5	99½	-1	5 7 0
London & Sub. Trac. 5% Pref.	1	Nil	Nil	10/-	—	... ...
London United Tram Deb.	Stock	4	4	52½	—	7 12 4
Mexico Trams, 5% Bonds	—	5	5	67½	-2½	7 8 2
Mexican Light Common	100	Nil	Nil	85½	—	... ...
do. 7% Pref.	100	7	7	76½	—	9 3 0
do. 1st Bonds	—	5	5	81	—	6 5 0
Victoria Falls Ord.	1	15	15	6 1/16	-1/16	4 17 10
Yorkshire (West Riding)		Nil	Nil	5/-	—	... ...

Manufacturing Companies.

Assoc. Elec. Ord.	1	6	6	25/6	-1/6	4 14 1
Babcock & Wilcox	1	13	15	56/3	-1/3	*5 6 9
British Aluminium Ord.	1	10	10	2 1/16	-1/16	4 17 1
British Elec. Transformer Pref.	1	7	7	8/9	—	... ...
British Insulated Ord.	1	15	15	82	—	4 0 0
Brush Ord.	Stock	10	10	120	—	8 6 8
Callenders	1	15	15	88	—	4 3 0
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Parkinson Ord.	5/-	—	30	25/-	+1/16	6 0 0
do. 8% Pref.	1	8	8	24/6	—	6 10 8
Edison-Swan 1st. Pref.	1	7½	7½	24/6	—	7 1 2
do. 5% Deb.	Stock	5	5	84½	—	5 18 4
Electric Construction	1	5½	5	13/3	—	7 11 0
Enfield Cable Ord.	1	20	20	4½	—	4 14 1
English Electric	1	Nil	Nil	3/9	—	... ..
do. do. Pref.	1	3	Nil	7/6	—	... ...
Gen. Elec. Pref.	1	6½	6½	23/6xd	+6d.	5 10 7
do. Ord.	1	10	10	47/6	-½	4 4 2
Henley	1	25	30	6½	-½	4 18 0
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India- Rubber	1	Nil	Nil	9/3	-9d.	... ...
Johnson & Phillips	1	10	10	1⅝	—	5 6 8
Siemens Ord.	1	7½	7½	23/9xd	—	6 6 4
Telegraph Construction	12	10	10	19½	—	*6 3 1

* Dividends paid free of Income Tax.

The Eastbourne Convention.

No. 4.—Incorporated Municipal Electrical Association: a note on the career of the new president and the conclusion of our report of the meetings and proceedings.

AT the annual general meeting of the I.M.E.A. held on May 30th, Mr. A. J. Fuller was elected president, an appointment that was referred to at the conclusion of the last instalment of our report of the Convention.

Mr. Arthur J. Fuller has had a varied career and, like many other prominent engineers of to-day (including his predecessor in office, Mr. J. K. Brydges), was associated in the early days of the electrical industry with the late Robert Hammond, whose staff he joined in 1889. He had previously had a year's service with the old House to House Electric Light Supply Co., when he assisted the chief engineer, Mr. Lowrie, in the design of many new forms of alternating-current machinery as a result of much experimental work.

In his first years with Robert Hammond he was engaged on the design and erection of complete generating stations, and his work included the inspection and erection of machinery at Blackpool, Burton-on-Trent, Dublin, and Leeds. From 1892 to 1894 he undertook, in effect, the sole responsibility for the designing and estimating department, acting as Hammond's chief outside engineer, in which capacity he supervised the construction of works at Wakefield, Coventry, Newport, St. Helens, and Ayr.

Mr. Fuller afterwards became borough electrical engineer at Ayr, and subsequently designed and carried out the complete electrical equipment of a considerable tramway system running through the North country.

In 1903 he came south on his appointment to his present position as consulting and electrical engineer to the Metropolitan Borough of Fulham. Since then great developments have taken place in the area which have involved practically the rebuilding of the works on two occasions to incorporate modern improvements.

The selection by the Central Electricity Board under the South-east England Electricity Scheme of the Fulham generating station was a tribute to its economical operation under Mr. Fuller and to the potentialities of the site for large-scale working. The new station, for the design and erection of which Mr. Fuller has been appointed joint consulting engineer with Messrs. Preece, Cardew and Rider, is to be of 300,000-kW capacity. It will clearly be necessary for him to devote most of his time to this duty and the Council has made special arrangements with this end in view.

Among his other activities, Mr. Fuller has had a long and extended experience with dust destructors, and also with brick and flag-making plants, in which he may be regarded as a pioneer.

Mr. Fuller has been a member of the Institution of Electrical Engineers since 1912, and last June was elected vice-president of the I.M.E.A. He has been president of the London Association of Engineers and also of the A.M.E.E. His present public offices include the secretaryship of the Wages Conference of Local Authorities (Greater London) and of Area No. 10 District Council for the electricity supply industry, and membership of the executive committee of the Conference of Local Authorities owning electricity undertakings.

Under his presidency the I.M.E.A. Convention next year at Douglas, Isle of Man, may be expected to maintain the high standard of its predecessors.

Elliott & Fry] *[London.*

Mr. A. J. Fuller,
President, I.M.E.A.

Domestic Water Heating.

Report of Joint Meeting.

Mr. A. E. McKenzie (borough electrical engineer, Wimbledon) opened an informal discussion on the above subject, which was continued in conjunction with the discussion on Mr. J. W. Burr's paper (see ELEC. REV., June 6th, page 1084) on the electrical heating of buildings. The meeting was a joint one of I.M.E.A. delegates and members of the Electrical Association for Women.

Mr. McKenzie, who was chairman of the special sub-committee of the E.D.A. appointed a few months ago to investigate means of providing hot water in the home and to suggest appropriate lines of development, intimated that the report of the sub-committee would shortly be available. The opinions he expressed (reported below) were, however, his own personal views.

Having established the popularity of the electric cooker, attention should be devoted to electric water heating, which offered unique opportunities for improving the load factors of undertakings more than any other type of load. Moreover, as most supply undertakings would in the near future be taking supplies from the Central Board on a two-part tariff in which the load factor would play such an important part, it was a matter which must appeal to every supply engineer. Unfortunately, the average householder had no idea of the amount of hot water he used daily, and therefore Mr. McKenzie suggested the employment of a special assistant for the development of this class of apparatus, who, in addition to having a good address and education, should have general knowledge of electricity and of the various types of water heaters, the ability to trace out existing piping arrangements and improve upon them when necessary, and be capable of advising the consumer which type of heater would suit his own particular conditions. At Wimbledon such a man was employed, and he estimated for everything required, including plumbing and piping alterations. It was important also that supply authorities should co-operate with builders in their districts, so that electric water heating, either entirely or as an adjunct to coke- or coal-heated boilers, should form part of their building programmes. Wimbledon had not standardised any particular make, or type, of heater, but installed heaters made by any reputable firm, preferably British (see illustration reproduced on page 1124).

Reference was made to the tariffs which have been devised at Wimbledon for electric water heating. Of four different systems, two were for night load and consumers were persuaded to adopt one of them, as they improved the load factor more than the other two, Mr. McKenzie holding the opinion that night-tariff water heaters of adequate storage capacity enabled the supply undertaking to cut off such heaters during the peak load without inconveniencing consumers and with great advantage to the supply authority. Owing to the present high cost of self-contained thermostatically-controlled heaters, the capital cost to the authority and the annual rental were considerably greater than when immersion heaters were installed in consumers' own tanks. Again, as the consumers'

outlay when using thermostatically-controlled heaters was £5, as compared with £1 15s. when using immersion heaters, most consumers preferred the latter, although their thermal efficiency was generally less than that of the former. The consumer was, however, influenced by the fact that the average price per kWh, when using immersion heaters on the second system, was less at all consumptions than on the first system mentioned. For both systems, however, change-over switches were fitted for connecting the water heater to the ordinary domestic-rate meter outside the non-tariff hours of 11 p.m. to 7 a.m. and 1 p.m. to 3 p.m.

In the first two instances mentioned electricity was supplied on a night tariff of 3 kWh for 1d. On the third system, namely, an immersion heater in the consumer's own hot-water tank, with a change-over switch, it was supplied at ½d. per kWh and at Wimbledon it appealed to consumers as the simplest arrangement; in practice, as cookers were seldom used for more than five hours per day, the water heater could be energised for the remaining 19 hours. In practice immersion heaters having a loading of 2 kW were generally sufficient to provide all the hot water required in medium-sized houses.

The fourth system appealed to consumers who desired to know exactly what the cost of running a water heater would be. In this case a fixed load was continuously in circuit, the water heater being supplied by the Corporation at an inclusive charge for energy and rental, there being no meter. The system had, however, its limitations and was only suitable for installation at points where hot water was actually required, namely, over the bath or sink.

Up to date 1,300 water heaters had been installed at Wimbledon, most of them of the fixed-loading type with an additional boost controlled by a switch at the consumer's will. During the last four weeks no fewer than 200 inquiries for water heaters had been received and 75 per cent. was going forward on one of the two night tariffs.

For switching off water heaters during the station peak, load levellers, which switched off the energy when a predetermined load on the consumers' premises had been reached, were considered unsatisfactory by Mr. McKenzie, as on dark and cold days the water heaters might be switched off for long periods when hot water was required. Relays on street-lighting mains, which switched off the heaters when the lamps were switched on and automatically switched the heaters on again after a predetermined interval, were also regarded as unsatisfactory, owing to difficulties introduced by foggy days and also because the method was only applicable where separate street-lighting mains were laid. Hand- and electrically-wound British-made time switches were world renowned and could not be beaten, but at present were too expensive to permit of their general adoption for water heating at 3 kWh per 1d. Synchronous motor switches, which it was said cost considerably less than half the price of a reliable hand- or electrically-wound time switch and could be thoroughly recommended for a.c. supply, had been installed in thousands on the Continent and were working very satisfactorily. Mr. McKenzie visited Amsterdam and The Hague in June, 1929, to study water-heating practice there, and had since ascertained that by April, 1930, no fewer than 8,825 night-tariff water heaters had been installed, increasing the night load by 8,000 kW. Dr. Luloffs, who was managing the plant there, told him that he was connecting additional water heaters at the rate of 200 per week, everyone controlled by a synchronous-motor switch. He had also been told by the engineer in charge of those switches that their maintenance cost was much less than that of the best time switches. The tariff at Amsterdam was two-fifths of 1d. per kWh from 11 p.m. to 7.30 a.m. and from 12 (noon) to 2 p.m., and four-fifths of 1d. at other times.

At The Hague, Herr Bakker had installed by April 22nd, 1930, some 7,776 water heaters, resulting in a night load of 5,088 kW. They were nearly all on the night-tariff system, controlled by synchronous-motor switches, and again he was given to understand that those switches were absolutely reliable and that their maintenance cost much less than that of time switches. At The Hague no meters were installed, fixed rentals being charged, varying with the size of the heater.

In Switzerland the daily load factor of the Basle undertaking had been increased from 61 to 88 per cent. in eight years, mainly by the installation of night-tariff water heaters. A number of his contemporaries and many manufacturers had tried to convince him that fairly heavily loaded thermostatically-controlled heaters, owing to the habits of British people, never took energy during the station peak load period and that motor and clock switches were therefore quite unnecessary. He had not been convinced, however, that the habits of British people were different from the habits of people on the Continent, and therefore some form of control was necessary. Instantaneous water heaters to give comparable service to gas geysers should be discouraged, because they were unnecessary and detrimental to the supply authority; at Wimbledon they were not connected to the supply system.

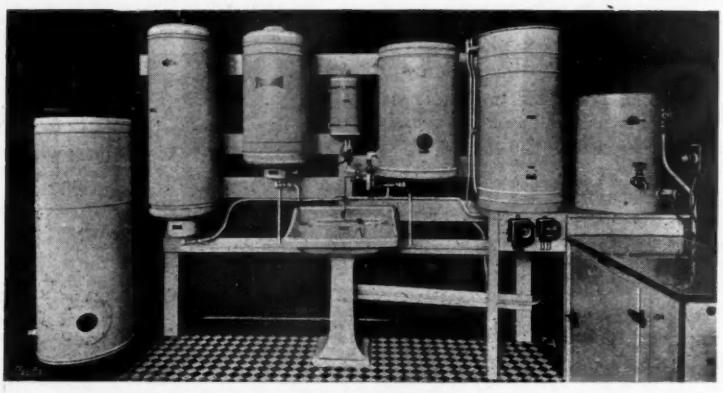
Although in many cases the cost of using electricity would be quite comparable with that of coal or gas, it was not necessary to emphasise the comparison too much. It was far better to argue on the basis of value for money and on the better service provided by the electrical method. As a result of his experience at Wimbledon, Mr. McKenzie had arrived at the following conclusions:—

1. Water heaters should be preferably cut off the station peak load now that apparatus for so doing could be obtained at a reasonable price.

2. Until manufacturers reduced the present excessive prices they were charging for water heaters, electrical water heating would not make the headway in this country that all desired; at present it was preferable to install immersion heaters in consumers' own tanks, as the capital outlay was so much less and obsolescence and maintenance were practically nil.

3. There should be a standard water-heating tariff throughout the country of three kWh for 1d. throughout the night and for two or three hours at mid-day.

At the conclusion of his opening statement Mr. McKenzie exhibited a specimen Warren synchronous-motor switch, the type used in large quantities on the Continent for water heating, street lighting, &c., and said that its makers gave it a guarantee for three years. A master clock had been installed at Wimbledon which maintained the frequency practically constant without difficulty throughout the 24 hours, so that there was no cumulative error, as makers of time switches would have one believe.



Demonstration Electric Water Heaters in Wimbledon Corporation Showrooms.

Mr. H. C. Lamb (chief electrical engineer, Manchester) expressed the view that it was dangerous to attempt to compete for the heating of large buildings with coal on a pure cost basis, because in many cases that would leave no margin and make the work not worth while. His experience was that for the heating of large buildings on the thermal-storage principle electricity could not compete with coal at a price which would be satisfactory to the undertaking unless all the important factors were taken into consideration, such as the saving of space to the consumer, the avoidance of dust and dirt by the absence of coal and ashes, and so on. Mr. Burr did not make it clear whether he actually supplied the large hospital referred to, but in Manchester recently a similar case had been considered, and he failed to secure the business. When water was required in large quantities it was very much more difficult to make a contract on satisfactory terms for heat supplied on the thermal-storage principle in competition with coal, or even oil, but when it was a case of heating a building, then electricity stood a very much better chance. There was a wide margin in the upper and lower limits of 0.3d. and 0.2d. given in the paper, and it was unfortunate that the author had made his calculations on the basis of 0.2d. per kWh, because that was likely to be taken as a general figure for that sort of supply and might do a great deal of harm. The point was to consider the cost at which large undertakings could afford to supply, because in future there would be two classes of undertaking, namely, those which purchased their electricity from the Central Board at grid prices and those which purchased on the basis of adjusted station costs. The grid prices for various areas had not yet been settled, but there were those who argued that the running charge should be a very low one and the fixed charge correspondingly high. If, however, the running charge were very low, say 0.2d. per kWh, what would be the use of talking about obtaining business at 0.2d. per kWh as the author did? In one case at Manchester a building was being supplied on the thermal-storage principle at a price which was well above Mr. Burr's lower limit.

Mr. L. Romero (Salford) supported Mr. McKenzie with regard to the Warren synchronous-motor switch and expressed the hope that the E.D.A. Committee would be able to arrive at some general tariff which could be adopted universally. Where an "all in" domestic rate was in existence at a reasonably low price per kWh every effort should be made to develop domestic water heating at that rate without any special restrictions to its use. Where water heaters with sufficiently low loadings and thermostatic control were installed the load factor was extremely good, and in the case of his own house was over 80 per cent. Water heaters should be let out

on simple hire, and the hire charge should include the total cost of fixing, including plumbing and wiring. Until he adopted that method in Salford progress was practically nil. A special type of water heater had been adopted at Salford, similar to the usual lagged storage system, thermostatically controlled, with a circulator for delivering small quantities of hot water rapidly, and a special feature was that it was designed to be fixed in place of the existing hot-water cylinder with connections to the boiler behind the kitchen fire. That feature appealed to a large number of consumers, because they were able to continue to use the fire when they so desired.

Mr. C. H. Smith (Electric Fires, Ltd.) did not think there would be much difference between the thermal efficiencies of the first two systems mentioned by Mr. McKenzie, whilst a big advantage of the second system was that larger storage capacity would probably be available in the existing tank and space would not have to be found for an auxiliary tank. His own view, however, was that the third system would be the most popular. He suggested wiring the water heater *via* the cooker position, so that any shortage of hot water during the day could be overcome by switching over to the ordinary heating-rate meter. The change-over switch could be fitted near the cooker—indeed take the place of the cooker main switch. A pilot lamp on the cooker side of the change-over switch would remind the consumer to switch over when the cooker was finished with. Not only should the special assistant Mr. McKenzie had referred to have the qualities mentioned, but also when he secured the order it should be his job to follow it up after completion and see that it gave consistent satisfaction. Personally, he would prefer to have two such men working in parallel and not in series, so that a healthy rivalry would be established. There was a great deal to be said in favour of the hire purchase of water heaters, or, failing that, a moderate payment in advance on a hire system, which would eliminate the unstable class of applicant. He believed that greater advantage would accrue to electricity undertakings from domestic water heating than from heating large buildings; whereas the latter when supplied as an off-peak load would improve the winter load factor, and incidentally the yearly load factor, it would not fill up the valleys in the summer; an off-peak water-heating load would operate usefully in summer and winter alike.

Alderman Mrs. S. E. Hammer (Hackney) expressed the appreciation of the Electrical Association for Women of the opportunity of taking part in the meeting, and said that a discussion of that nature enabled those women who had to go about the country discussing electricity from the women's point of view to put the case much more effectively. The great thing required was simplicity of tariffs. The average woman did not mind paying for what was used, but she could not understand two-part tariffs and standing charges, and therefore it seemed to her that some method of standardising charges throughout the country would be a very great advantage.

Mr. E. Seddon (chief electrical engineer, Edinburgh) had been somewhat disappointed to find that only half the story had been told by Mr. Burr. It would be interesting to know whether his competitive costs had been compared as between coal-fired and electrical plant. In Edinburgh there were eight or nine public wash-houses in which until recently all the auxiliary plant had been run by steam, but he had been able to get it changed over to electricity. More recently it had been proposed to erect a wash-house in the centre of the City and he had been asked to prepare an estimate for electrically-heated plant. The wash-house would have required an average of 3,000 lb. of steam per hour for a period of ten hours per day, or 30,000 lb., and the annual charge on the steam plant would have worked out at £857, whereas for electrical plant the overall annual capital and operating charges would have been £4,472, which, of course, made the proposal quite hopeless. That was worked out on 11,000 B.th.u. coal at 18s. per ton and electricity at 0.25d. per kWh. He contended also that, even on off-peak load, the charge made for supply should not be entirely free from its obligations to the other costs of production, whereas the author had based his calculations on coal only.

Mr. E. E. Sharp (Venner Time Switches, Ltd.) pointed out that the information Mr. McKenzie had received from the Continent was given to him by the designer of the synchronous-motor switch that had been exhibited. The comparison of cost that had been made was not relative to an English time switch, and he wondered whether Mr. McKenzie knew that The Hague people had recently ordered 1,000 English time switches and at the present time were negotiating for another 2,000 or 3,000, which indicated that there was something to be said in their favour. If engineers in this country required synchronous-motor switches, they could have them from this country just as well as from Germany or America. They had all been circularised recently and asked what they thought about it as a guide for manufacturers in this country to know what they should do, but only a few engineers had troubled to answer and in those cases the answer had been against synchronous-motor switches, except in one case. As a matter of fact, he had had a long discussion with Mr. McKenzie on that very point a few months ago, to settle whether those things should be made in England or not, and Mr. McKenzie had concluded the discussion by saying that he was most decidedly of the opinion that time switches were the best things to use. Until the day before the discussion the speaker himself had no idea that Mr. McKenzie had changed his mind. In fact, on the contrary, a week before Mr. McKenzie was asking about time switches. He was rather inclined to think Mr. McKenzie had been very controversial in order to stimulate a good discussion and did not mean half what he said. Speaking generally of water heating, Mr. Sharp expressed the hope that some endeavour would be made to standardise tariffs, because a great deal of business had been lost in the past owing to complicated tariffs and they did not want it to happen again with regard to water heating. A very large number of water heaters were used in Auckland, Wellington, and Christchurch (New Zealand) in conjunction with time switches and it had been found there that water heating was even more popular than electric cooking. In Auckland, for instance, there was one water heater for every two consumers, but only one cooker for every five consumers. Some 10,000 water heaters were controlled by hand time switches and the conditions in New Zealand generally were very similar to what they would be very soon in this country. On the question of whether thermostatically-controlled water heaters came on the peak or not, in his own house he found that out of 182 days, *i.e.*, six months of the year, on only 20 days did the water heater miss being on the peak.

Mrs. H. A. Howie (Walsall) had recently installed two systems of water heating in her house, namely, a circulating system in connection with the kitchen fire and also two immersion heaters in the ordinary 50-gallon tank, one heater being at the bottom of the tank and the other half way up, thermostatically controlled. Unfortunately, although a comparison was hoped to be made, the circulating system broke down. As regarded the other system, it was found that for a family of from three to five people the consumption was from 10 to 12 kWh per day, which was very high. If there were a tariff of ¼d. per kWh the cost would be from 3s. to 3s. 6d. per week, but under the conditions at Walsall the cost was 5s. 3d. per week, which was out of the question. Therefore, she hoped it would soon be made possible for all supply authorities to offer very low rates for water-heating purposes.

Mr. E. E. Hoadley (chief engineer, Maidstone) expressed the view that complications in charges for water heating should be avoided. At Maidstone, where he claimed to have done some work in that connection, he had not found it possible to go as low as three kWh for 1d. and did not complicate the issue with time switches. At ¼d. per kWh he was getting quite a lot of business and, judging from the experience of his own house, the water heating was very rarely on the peak load. He believed that water heating had been the saviour of a great many cookers, because it overcame the great bugbear of the slow boiling of water on electric cookers inasmuch as hot water could be used in the first instance. He had found it a good commercial point to be able to tell intending users of water heating exactly what it was going to cost and in order to do that he had installed meters on a number of tanks, which were read weekly. Speaking in rough averages, a 22-gallon tank used on an average over several months 71 kWh per week; a 10-gallon tank used 37 kWh per week, and a 1½-gallon tank used 14 kWh per week; he was impressed with the belief that water heating was going to be one of the biggest things the electrical industry had ever embarked upon. It was a seven-day load for 52 weeks in the year, and would not be interfered with by strikes or bad trade. It was to be hoped, therefore, that the Electrical Development Association would inaugurate an intensive campaign relating to electric water heating. There were, however, one or two things which the manufacturers must do. One was to standardise heating elements, particularly the fitting arrangements, so that in the near future it would be possible for a user of hot-water apparatus to go to any ironmonger and buy a 500-watt heating element and screw it into his tank just as he now puts a lamp into a lamp holder.

With regard to Mr. Burr's paper, several examples of low-temperature heating had been in existence for two years in Maidstone and their users were thoroughly satisfied, both with the service they obtained and the cost, electricity being supplied at ¼d. per kWh in the summer six months and ¾d. per kWh in the winter six months.

Mr. C. G. Nobbs (George Nobbs, Ltd.) drew attention to a system which combined ventilation and heating. No patents or royalties were attached to it and the method was to pass air over resistors or a battery of pipes which could be heated on the electrical thermal-storage system, the hot air being conveyed to the various rooms, if necessary, after washing it. In that way it was possible to introduce hot air into rooms at any particular point in a building and to meet the varying conditions of the climate. He supported the plea for simplicity of tariffs.

Councillor Mrs. Gregory suggested that the phraseology adopted by Mr. McKenzie in his water-heating tariffs would not be understood by the ordinary housewife at all. The Electrical Association for Women was doing its best to encourage, not only electric cooking, but also water heating, and unless a simple tariff could be placed before the women of the country it would be impossible to explain the position. Hot water was required at all hours of the day and switching off supply at certain hours of the day certainly would not help to solve the problem, unless means were provided to ensure that the water was kept hot during those periods. With regard to Mr. Burr's paper, she was specially interested in the heating of hospitals and looked forward to the time when hospitals would be all-electric, not only for the comfort of the patients, but also in the interests of the staff. One of the drawbacks in connection with water heating and other electrical apparatus at the moment was the high price. For many years attention had

been called to the high price of electric cookers, and very few people could possibly afford to put in half the apparatus on the market. Five years ago she had drawn attention to this matter, but there did not seem to have been very much improvement.

Mr. J. W. Burr, replying to the discussion on his paper, said he had obtained the contract for the hospital to which he had referred. All the circumstances of the particular case were taken into consideration and, of course, every instance must be dealt with on its merits. The particular instance had been considered carefully, not only by his own Council, but by an adjoining authority also, and he did not wish anybody to run away with the idea that the Swansea Corporation had launched out on something that was commercially unsound. "Black heat," which he assumed to be some tubular method of heating, was in use in a number of kinemas in Swansea, and unfortunately the load coincided with the lighting peak. The hospital mentioned in his paper was relying upon electricity for everything, heating, lighting, and cooking.

Mr. A. E. McKenzie, in his reply, dealt with Mr. Sharp's comments in particular. With regard to Amsterdam and The Hague, the figures he had quoted had been given him quite recently and they substantiated figures which he obtained himself less than 12 months ago when he visited those two places. Nothing he had said in opening the discussion had condemned time switches; indeed, he had started off by saying that British time switches were world renowned and could not be beaten, which was perfectly true. If he had to decide between time switches and synchronous-motor switches, prices being more or less equal, he would have time switches every time. Nevertheless, it was the fact that if he used British-made time switches his capital outlay would be more than double, as compared with synchronous-motor switches, and until he found that the latter would not be suitable his money would be spent in buying them. He was also very interested in Mr. Sharp's statement that his own particular water heater was only off-peak 20 times out of 22. The point was that having to purchase electricity from the Central Electricity Board at anything like £4 per kVA, that apparatus should be kept off the peak in any case, and very cheap apparatus was available for doing it. He had been accused of making tariffs complicated, but it was the first time that it had ever been said of him. As a matter of fact, there were no fixed charges in Wimbledon, and the consumer paid only for what was used. At the same time, he had devised several tariffs, so that if one did not appeal to a consumer another might. From that point of view, if necessary, he would double the number of tariffs, so long as he got the business. At the present time he was getting the business and making money out of it. If the consumer wanted the simplest tariff, he could have electricity at ½d. per kWh, combining the water heater with the cooker by means of a throw-over switch. The standard cooker-control switches at Wimbledon had two positions only, one for the cooker and the other for the water heater, and such control boards were always installed on the cooker, whether a heater was put in or not, so as to provide facilities for the future, the difference in cost between it and a plain switch being only 2s. or 3s. He agreed that the cost of thermostatically-controlled heaters was certainly greatly in excess of what it should be. If manufacturers would bring down prices there would be an enormous increase in the demand for water heating, which would provide at the same time the most valuable type of load generating stations could have.

Mr. A. J. Fuller (chief engineer, Fulham), in proposing a vote of thanks to the authors, said he often found that water-heating apparatus was not sufficiently lagged, and he urged that greater attention should be paid to this. The cost of apparatus, too, was undoubtedly far too high. He had gone into this matter some two years ago in his district, which was not a rich one, but he met with no success at all when he approached manufacturers, who would not reduce their prices at all. He then got his Committee to agree to what was really a gamble, namely, to place apparatus out on hire at charges which included nothing whatever for interest, repairs, or maintenance, and he had been perfectly satisfied with the results. Some 400 cookers had been installed since January 1st, without any previous propaganda, and they were being installed at the rate of 15 or 20 per week. The grid price was very important and ought to be taken up with the Central Board. If, in fixing prices for bulk supplies, the maximum-demand charge were increased and the running charge reduced, it would give an opportunity to all suppliers of pushing the use of electricity in the home. It was easily possible to supply such institutions as hospitals with from 3 to 10 million kWh per annum at 0.3d. per kWh. It was being done quite easily in the London area, and therefore how much more easily could it be done in a place like Manchester where coal was so much cheaper! At present he was investigating the question whether it was possible to change over to electric heating all the baths and public buildings in Fulham, as an example to all other large buildings in that area, and he hoped by the next Convention to be able to say that it had been successfully accomplished.

Annual Dinner.

The annual dinner was held at the Grand Hotel, Eastbourne, on May 29th.

Proposing "The Incorporated Municipal Electrical Association," **Col. Sir Thomas F. Purves** (president of the Institution of Electrical Engineers) referred to the close working between the Institution and the I.M.E.A., inasmuch as the latter was represented upon many of the standing committees of the Institution, which appreciated the help it received in that and many other ways, which, he believed, was mutually beneficial. He not only represented the Institution on that occasion, but presumed he would also be regarded as representing the Engineering Department of the Post Office, the work of which involved negotiations with municipalities throughout the country, and the relations between them were of the most cordial and friendly kind. When there was any difficulty with regard to Post Office Regulations about such things as clearances between telephone wires and lighting and power circuits, it would always be a good thing if the engineers concerned would go to the Post Office and let them know about it quietly, so that it could be discussed between man and man, and they would always find the Post Office ready to take account of special local conditions. He was certain that a great deal of trouble was often caused by trying to apply regulations to conditions to which they were never intended to apply when they were framed. A great deal of misunderstanding would be avoided if both sides would get together in that spirit.

Mr. J. K. Brydges, president, I.M.E.A., in responding to the toast, spoke of the growing importance of the I.M.E.A. and of how it was now consulted by all important Government departments upon any matter relating to electricity supply. Eastbourne had been promised a supply from the grid by October 1st, and he hoped that the anticipations of the Central Board on that matter would be fulfilled, otherwise he feared Eastbourne would be in a rather difficult position during the coming winter, because the Commissioners had refused the Corporation permission to extend its generating plant. The Convention attendance of over 1,100 was the largest of any convention, and he thanked the Mayor and Corporation, on behalf of members and visitors, for all that had been done for them. He made a strong plea that every municipal electricity committee should subscribe on the full scale towards the work of the British Electrical Development Association, and all possible support should be given to the Electrical Association for Women, which now had a membership of 4,000, and was doing valuable propaganda work among the women of the country, who were such an important factor in developing the use of electricity in the home. They often heard that the consumption of electricity in this country per head of the population was not what it should be; one way to get over that was to adopt low tariffs for domestic purposes and also for supply authorities to look ahead and spend money on laying mains. That policy was being adopted in Eastbourne and, thanks to the progressive policy of the Electricity Committee, which was fully backed up by the Corporation as a whole, any profit that was made went towards the reduction of charges rather than in assisting the general rates of the town. The result had been that the charges in Eastbourne were among the lowest in the country.

"The County Borough of Eastbourne" was proposed by **Sir Harry Hatt** (chairman of the Bath Electricity Committee) and was responded to by the Mayor of Eastbourne, Councillor **Lt.-Col. Roland Gwynne,** D.S.O.

Mr. A. J. Fuller (vice-president, I.M.E.A.) proposed "Our Guests and Ladies."

Mr. W. W. Lackie (Electricity Commissioner) responded, remarking that it might be felt that, as the Commissioners had prepared eight schemes under the Electricity (Supply) Act of 1926, their work was finished, but in his opinion their work was only beginning.

Annual Meeting.

The annual meeting on May 30th was, as usual, private. The new president and officers, together with new members of Council, are:—*President*: Mr. A. J. Fuller (Fulham, London); *vice-president*: Mr. C. G. Morley New (Cardiff); *hon. treasurer*: Mr. A. Nichols Moore (Newport, Mon.); *hon. solicitor*: Mr. J. H. Rothwell (town clerk, Brighton); *hon. secretary*: Mr. A. C. Cramb (Croydon).

Members of Council to fill vacancies:—*Large undertakings*: Messrs. E. E. Hoadley (Maidstone), G. Porter (Worthing), R. W. L. Phillips (Bedford). *Small undertakings*: Mr. F. Newey (Long Eaton). *Local authority representatives*: Alderman R. S. Chatfield (Eastbourne) and Councillor R. Richardson (Hull).

Hydro-electric Works and Ice.

In Canada it has been found that the formation of ice in winter time is a great hindrance to the operation of hydro-electric installations. Through the formation of ice the supply channel which is provided with grates is at night time often frozen up in a few moments. It has now been found in association with the many experiments carried out by Dr. Howard T. Barnes, who is engaged on methods for the dispersal and prevention of ice, that the irradiation of the grates by means of powerful electric glow lamps hampers the formation of ice in a high degree. The use of thermit, sodium, and calcium for breaking up the ice has also met with successful results.

The Electrical Trade of Holland.

A Comparison of Imports and Exports for 1928 & 1929.

THE following statement, shewing the imports and exports of electrical and similar goods into and from Holland during the year 1929 is compiled from the recently-issued statistics. The figures for 1928 are added for purposes of comparison and notes of any increases or decreases are given :—

Imports.

	Thous. Guilders. 1928.	Thous. Guilders. 1929.	Thous. Guilders. Inc. or dec.
Electric generators, motors, transformers and rotary convertors—			
Total	8,720	9,680	+ 960
From Germany	4,540	6,100	+ 1,560
,, Great Britain ...	1,320	910	− 410
,, Switzerland	800	730	− 70
,, Belgium	890	740	− 150
,, United States ...	230	230	—
,, France	440	210	− 230
Electric locomotives—			
Total	98	63	− 35
Wireless apparatus—			
Total	9,460	18,080	+ 8,570
From Germany	4,180	9,390	+ 5,210
,, Great Britain ...	1,760	2,990	+ 1,230
,, France	350	490	+ 140
,, United States ...	520	880	+ 360
,, Switzerland	†	2,240	—
Telegraph and telephone apparatus—			
Total	8,340	6,550	− 1,790
From Germany	4,740	3,720	− 1,020
,, Belgium	1,150	890	− 260
,, Sweden	1,470	940	− 530
,, Great Britain ...	220	240	+ 20
Other electrical apparatus and instruments—			
Total	8,270	10,490	+ 2,220
From Germany	5,860	7,780	+ 1,920
,, Sweden	200	90	− 110
,, Great Britain ...	870	1,180	+ 310
,, United States ...	—	190	+ 190
,, Switzerland	540	690	+ 150
Steam boilers—			
Total	6,930	6,420	− 510
From Germany	2,270	3,200	+ 930
,, Great Britain ...	2,650	2,300	− 350
,, Belgium	580	300	− 280
,, France	1,050	440	− 610
Electric cable, insulated—			
Total	7,840	12,950	+ 5,110
From Germany	6,353	11,020	+ 4,667
,, Belgium	950	990	+ 40
,, Great Britain ...	180	†	—
Steam engines and turbines—			
Total	3,590	3,620	+ 30
From Germany	1,470	1,220	− 250
,, Great Britain ...	1,000	910	− 90
,, Belgium	350	270	− 80
,, Sweden	110	46	− 64
,, Switzerland	400	710	+ 310

Exports.

	Thous. Guilders. 1928.	Thous. Guilders. 1929.	Thous. Guilders. Inc. or dec.
Wireless apparatus—			
Total	22,000	81,460	+59,460
Electric generators, motors, transformers and rotary convertors—			
Total	7,110	4,420	− 2,690
To Germany	2,050	1,380	− 670
,, Belgium	670	610	− 60
,, Dutch East Indies ...	790	860	+ 70
,, Spain	390	180	− 210
,, South Africa	†	90	—
,, Australia	390	†	—
Telegraph and telephone apparatus—			
Total	560	950	+ 390
To Great Britain	360	540	+ 180
,, Dutch East Indies ...	100	220	+ 120
,, Germany	40	80	+ 40
Other electrical apparatus and instruments—			
Total	3,170	4,430	+ 1,260
Steam boilers—			
Total	2,170	2,420	+ 250
To Dutch East Indies ...	1,350	1,150	− 200
,, Curacao	170	780	+ 610
Insulated copper wire and cable—			
Total	4,111	5,440	+ 1,329
Metal-filament lamps—			
Total	23,900	23,860	− 40
Steam engines and turbines—			
Total	2,100	2,090	− 10
To Germany	120	40	− 80
,, Belgium	80	250	+ 170
,, Dutch East Indies ...	1,200	1,210	+ 10
,, Italy	140	†	—

(Florin or Guilder = about 1s. 8d.)
† Not separately distinguished.

Holland's exports of power plant last year were less in value than in 1927 as well as in 1928, and were only half the value of imports, which are still advancing. Her shipments of wireless apparatus show an increase in value of over 250 per cent. in the years under review. On the other hand, Holland is a greater importer than exporter of other telephone and telegraph apparatus and of electric cable.

The World's Radio Trade.

A D.O.T. Summary of German Statistics.

THE Department of Overseas Trade has recently gathered from a German source, and co-ordinated, a great deal of information regarding the external trade of the leading countries producing radio apparatus.

Statistics for the last five years show that, while the United States and Germany have doubled their exports of this class of goods, and Holland's exports have been multiplied by nearly 50, Great Britain's trade has declined. A table included in the matter gives the following figures for 1929, and the 1925 values are given in parenthesis :—United States, £4,750,000 (£2,080,000); Germany, £3,444,000 (£1,615,000); United Kingdom, £1,177,000 (£1,289,000); and Holland, £3,390,000 (£71,000). France, Austria, Sweden, and Italy are also exporters of radio apparatus. A table showing the regional distribution of the exports of the four leading countries demonstrates the fact that Germany and Holland export approximately 80 per cent. of their products to other European countries; that the United States exports to Canada are about half of its total exports; and that the United Kingdom sends two-thirds of its radio exports to Europe and Australasia.

The overseas trade of each of the four countries is analysed according to markets for the years 1925 to 1928 inclusive (to 1929 in the case of the United Kingdom). From the details given it is seen that in 1929 Holland was the United Kingdom's leading customer, taking goods to the value of £146,000; Australia, with £139,000, was next, and some way behind there followed Japan, Italy, and Belgium, whose shares were valued at £50,000 or more. As already stated, Canada is by far the most important market for the United States, and in 1928 the Dominion took American radio goods to the value of £1,105,000. Argentina accounted for £318,000, Australia for £248,000, the United Kingdom for £97,000, and Brazil for £91,000. Germany's principal customers in 1928 were the United Kingdom (£276,000), Holland (£268,000), and Denmark (£217,000). In the case of Holland, France headed the import list with £279,000, followed by Germany (£238,000), and the United Kingdom (£208,000).

The statistics conclude with a review of the principal importers of radio goods, of which Canada is the first. In the year ended March 31st, 1929, Canada imported radio products worth £1,228,000 (against £765,000 in 1927-28). Holland is second in the list with £1,000,000 worth in 1929, as compared with £526,000 worth in 1928. Next in order comes the United Kingdom—£695,000 in 1929 and £459,000 in the preceding year. The list is concluded with details of the radio import trade of Argentina, Australia, France, Denmark, Italy, Germany, Sweden, Belgium, Switzerland, Japan, Poland, Spain, India, Brazil, Austria, New Zealand, South Africa, Norway, Jugo-Slavia, Chile, and Czecho-Slovakia.

British firms can obtain a copy of the statistics upon application to the Department at 35, Old Queen Street, S.W.1, quoting Reference B.6399.

Indian Electrical Notes.

(By our Indian Correspondent.)

Progress in Hyderabad.

Electrical progress in the Hyderabad State is proceeding apace. The scheme to supply power to large district towns for industrial and lighting purposes has now been extended to Auragabad City and Cantonment, and estimates for the supply of power to Raichur and Warrangal towns amounting to Rs. 6 lakhs and Rs. 12 lakhs, respectively, are under consideration. A Government resolution states that the use of electricity for domestic and other private purposes is becoming more and more popular and that the prospects of its future expansion are bright. It is the policy of the Government to liberally subsidise new undertakings in the beginning with a view to encouraging local enterprise.

Mysore's New Installation.

The Government of the Mysore State has erected a new installation in the flourishing taluka of Malavalli which was opened by the Dewan of the State in the last week of April. The entire taluka and the surrounding area carry on the silk industry on a large scale, and the policy of the Government as set forth by the Dewan (Minister) is to illuminate every possible village and hamlet in the State with electricity.

Progress at Pykara.

The construction of the Pykara hydro-electric scheme in Madras, which was recently sanctioned, is now well in hand, and work is being pushed on with the object of carrying out a substantial part of it before the rainy season sets in. An important question is that of obtaining suitable machinery and Mr. Howard, chief engineer for hydro-electric development, is to visit Europe to consult leading manufacturers.

Telephonic Communication.

There will soon be direct telephonic communication between Hyderabad and Bombay. The proposal is to construct a trunk telephone line between Hyderabad (Deccan) and Sholapur, the latter city being already linked with Bombay. Negotiations are now in progress between the Nizam's Government and the Bombay Government. The line will cost the Nizam's State Rs. 4 lakhs and Rs. 40,000 will be paid to the Bombay Government for the use of the line between Sholapur and Bombay. This important development will link up Hyderabad not only with Bombay but with Delhi and Calcutta.

Railway Electrification.

According to the Administration report of Railways in India, during the past year considerable progress was made in the electrification of railways in the Bombay zone as compared with Calcutta. An examination carried out of the probable development of traffic if electrification of the suburban lines in Calcutta was undertaken, has shown that electrification will not be financially successful unless the railway can deposit passengers nearer their place of business in Calcutta. It has now been decided to re-examine the old proposal to connect the suburban systems of the E.I.R. and E.B.R. by means of a tube railway.

Electricity for Goa.

It has been decided to provide an electricity supply for the town of Nova Goa. The Government there has contracted with the A.E.G. India Electric Co., Ltd., of Bombay, for the installation of plant in the capital and the works are to be completed by the end of the year. The works will cost about Rs. 2¼ lakhs. Electric power will be generated at 500 V d.c., the distribution being on the 3-wire system by overhead lines. The plant will consist of three Krupp 4-cylinder Diesel engines, developing 190 b.h.p. at 300 r.p.m. direct-coupled to A.E.G. 115-kW generators.

Wireless Broadcasting Board.

Now that the Indian Broadcasting Company has been taken over by the Government of India, it is understood that a Board will shortly be appointed. The Board will be known as the Indian Broadcasting Board, and will meet periodically to deal with questions of policy and control and probably appoint directors in Bombay and Calcutta to conduct the broadcasting business and superintend the preparation, performance and broadcasting of programmes in those places. The Department of Posts and Telegraphs which took over the concern, is now engaged in framing a policy of development.

Electricity Supply.

Electricity supply companies in India are showing continued progress and expansion. At Barrackpore, the old plant has been replaced by an up-to-date one and three oil-driven generating sets have been installed. In Benares it has been necessary to install larger plant to meet the water-works demand, and large extensions of mains have been carried out. At Rawalpindi, the company has increased its share capital and has added new plant to its equipment. At Bareilly, the Cantonment area has now been included in the operations of the company.

Accident Prevention in Electrical Works.

A Summary of a Paper read by Sir Felix Pole at the National Safety First Congress.

SOME interesting facts on organised accident prevention were given by Sir Felix J. C. Pole, chairman of Associated Electrical Industries, Ltd., in a paper which he read before the recent National Safety First Congress, at Liverpool. He said that in one large works with which he was closely associated, statistics which had been compiled over a period of years showed that between 80 per cent. and 90 per cent. of the total accidents had nothing whatever to do with machinery, and that over 90 per cent. were due to causes over which the employer had little or no control. Safety First Committees had been established at the factories of the British Thomson-Houston Co., Ltd. These committees held monthly meetings, at which all serious accidents, involving absence from work, which had occurred during the previous month, were reviewed, and causes, as specified by the Safety Inspector, were discussed, together with any suggestions for preventing a repetition of similar accidents. The Safety Inspector made regular reports on plant and apparatus requiring attention, copies of which were sent to the shop superintendent concerned, to the maintenance department, and to the management. It was understood by everyone that very prompt attention must be given to these matters. In the event of a serious accident, an investigation was made on the spot immediately, and photographs were taken if considered desirable. The evidence of eye-witnesses was also taken. An important point in accident prevention was the investigation of dangerous occurrences which might have caused accidents. Unremitting attention was paid to the maintenance of buildings, plant, machinery, and lifting tackle, to ensure its good and safe condition.

In his reports on accidents, the Safety Inspector gave his opinion as to whether an accident which occurred was due to: (*a*) carelessness on the part of the injured person; (*b*) carelessness on the part of a fellow workman; (*c*) absence of clear and definite instructions on the part of those in authority; (*d*) defective machinery, appliances, material, &c. A complete analysis was made yearly of accidents under various headings.

The Safety Inspector, in addition to the investigation of accidents, danger spots, &c., did much propaganda in the course of his rounds in the factory, such as quietly putting suggestions to the employés and asking their opinion on the various machines, &c., with which they worked, and impressing on them to use, for their own sake, such things as goggles, chipping screens, protective gloves, respirators, &c., where desirable from the nature of the work. Such suggestions were followed up by tactful reminders to the foremen, chargehands, &c. Special pamphlets or cards had been prepared and issued to those on particular jobs.

The Metropolitan-Vickers Electrical Co., Ltd., had a similar organisation to that of the British Thomson-Houston, Ltd., except that, after the issue of the draft Safety in Factories Order by the Home Office it overhauled its safety organisation and set up a general committee for safety propaganda purposes and also an executive committee for the investigation of accidents and dangerous occurrences. Special attention was given to first aid, and there was an efficient ambulance department (*vide* ELECTRICAL REVIEW, March 28th, p. 577).

It was found that an analysis of all accidents under the head of *causation* was of great importance. By far the most frequent causes were handling and moving material, slipping and stumbling, striking against objects, and objects falling from a height or from a bench, and the use of hand tools. These were causes over which those in authority had little or no control, and it was only by educating people to a sense of safety and care for themselves and others that much improvement could be hoped for.

Instead of an increase being manifested by the general speeding-up of production, there had been a decrease of time lost due to accidents. In 1924 the time lost per unit of factory cost output was 2.4 hours, which had gradually fallen to 1.6 hours last year. Over a period of years they had found that the *total* number of accidents was approximately three times the number of those which were serious enough to involve absence from work. The decrease in the number of accidents alone was not a sufficient measure of success, since it obviously was related to the average number of workpeople, and to the number of hours worked. In the British Thomson-Houston works the percentage of time lost through accidents to the total time worked had varied from .425 per cent. in 1903 to .3 per cent. in 1929. It reached a maximum of .525 per cent. in 1925. The trend of the curve was towards a lower percentage. The number of accidents per 100,000 hours worked was also gradually falling, being 2.6 in 1929, as against 3.7 in 1923. The severity, as measured by the time lost per accident, remained approximately constant at about 120 hours, though in 1925 it rose to 175 hours. The accident compensation paid per person employed also showed a falling tendency.

The National Physical Laboratory.

Extracts from the Annual Report of the Executive Committee for the Year 1929.

THE annual report of the executive committee of the National Physical Laboratory for the year 1929*, submitted to the General Board at its May meeting, is plain evidence that the demands made on the Laboratory by the public show no signs of diminishing; indeed, the volume of work carried out for firms and outside bodies for which payment is received was greater than in any previous year. At the same time a large amount of research was accomplished of direct interest and importance to industry, including, in particular, research undertaken under the control and guidance of boards and committees appointed by the Department of Scientific and Industrial Research, among which may be mentioned, for example, the work on materials for use at high temperatures, such as are employed in the high-pressure steam turbine, on light alloys, lubrication, &c. Satisfactory progress has also been maintained in the work on laboratory units and standards of measurement, which makes continually increasing demands on the time and attention of the staff.

The total number of tests carried out during the year was 52,581, an increase of 2,088 on the previous year (excluding 621,303 clinical thermometers tested in 1929, an increase of 101,506); of the total, 2,525 tests were carried out in the electricity department in 1929, compared with 4,069 in 1928. The extra-high-voltage building is coming into full use; new buildings are to be commenced this year and additions made to the existing accommodation, which have been rendered necessary by the increasing volume of work undertaken.

A large amount of work was in progress for the purpose of the intercomparison of standards of measurement with other national laboratories, including an international intercomparison of resistance thermometers and of the thermocouple scale, while the standard optical pyrometer of the laboratory was calibrated at the melting point of gold (1,063 deg. C.), which involved the maintenance of four kilogrammes of gold at a temperature of about 1,050 deg. C. for a period of eight weeks, a novel type of nichrome-heated furnace being employed. International intercomparisons of electrical units were obtained during the year by measurements of standard coils and Weston cells.

Researches on sound problems have been in progress at the Laboratory for some ten years, under very adverse conditions; the difficulties arising from the unsuitability of the accommodation available, as well as from building vibration and extraneous electrical disturbances, have been profound, despite which the great variety of investigations undertaken and their value have already been widely recognised; a commencement will be made with the erection of an acoustics building during 1930.

Investigations into the subject of noise and its measurement, for the Aeronautical Research Committee, and also relative to street noises for the Ministry of Transport, are of much general interest. A method of measuring noise intensity has been developed on the same principle as that employed by Barkhausen. Sound is produced in a telephone ear-piece by alternating current, the magnitude of which can be regulated, thus varying the intensity of the sound. With the telephone held to one ear, the current can be adjusted until the sound is judged to be equal to the noise heard by the other ear; alternatively, the current can be varied until the telephone note is just masked by the noise. The intensity of the sound produced by the instrument can be varied over a wide range, from an almost painful loudness at which feeling, rather than hearing, supervenes in the ear, down to the limit of audibility. The scale of loudness has been calibrated in absolute units by the use of a microphone giving acoustical pressures in dynes per cm^2.

Measurements of the radium purchased for the nation by the National Radium Trust were made, and the Laboratory has also undertaken for the National Radium Commission the distribution of the radium to the hospitals and centres authorised to receive it. This work involves initial tests of the platinum containers for leakage as well as determination of the amount of radium they contain; containers returned to the Laboratory from hospitals will again have to be tested for leakage and for content prior to repair if any leak is found. Records of the containers and their contents will be kept at the Laboratory.

In the paragraphs which follow, brief reference is made to some of the more important of the researches which were in progress during the year in several departments of the Laboratory.

In the Physics Department the investigation of the thermal and electrical conductivities of alloys is being continued up to temperatures of 800 deg. to 900 deg. C.; initial measurements have been made on a specimen of "Armco" iron, which will be used as a standard for comparative measurements on other metals and alloys.

New power supply has enabled the high-frequency induction furnace to be used up to its maximum rated capacity of about 10 kVA, and a new method has been devised of heating metals of low resistivity, by enclosing them in a suitable refractory crucible within a sleeve of a material which absorbs the power more readily. With a molybdenum sleeve temperatures above the melting point of platinum, 1,750 deg. C., were easily obtained in a crucible capable of holding a kilogramme of platinum. A number of investigations have also been carried out for the British Electrical and Allied Industries Research Association.

In the Radiology Division preliminary work on the scattering of X-rays has led to the conclusion that the problem of atomic scattering is best attacked by the use of homogeneous radiation incident upon a single crystal of only one element. The effect of considerable temperature variations will be examined and work has begun on a single crystal of aluminium. A powerful primary beam is necessary, and a special X-ray tube has been designed for the purpose. The Division has collaborated with the Engineering Department in research on fatigue in single metal crystals by X-ray analysis, to determine the orientation of the crystal axes and the degree of distortion produced by subsequent mechanical treatment. Experiments are in progress on a method of applying thermionic valves to the amplification of ionisation currents produced by the gamma rays from radium, and of using such amplification to facilitate the comparison of radium samples. The inspection of X-ray departments in hospitals in accordance with the international recommendations for protection has been continued. A survey of electrical insulating materials has commenced, and the orientation of the axes in artificial sapphires used for jewel bearings has been determined for the Metrology Department, and the positions of the electric axes of a quartz crystal for the Electricity Department.

In the Optics Division a method in which two photo-electric cells are balanced against each other has been tried for accurate visual spectrophotometry and promises to have useful applications. The ultra-violet absorption apparatus continued to give satisfactory use.

In the Electricity Department investigations were directed to improvement in the methods of measurement employed for various purposes: a bridge method has been developed for high precision measurements of self-inductance and effective resistance at high frequencies; the measurement of the phase angles of potentiometers, potential dividers, &c., has been studied; the apparatus for the measurement of the relative phase and amplitude ratio of input and output voltages of amplifying systems has been further investigated and improved; and a comparison has been made of bridge and wattmeter methods of measuring total losses. The surface resistivities of various dielectrics have been examined under prolonged exposure to the action of light. Samples of pure iron made in the Metallurgy Department were tested for permeability and hysteresis. Work on the primary standards has been proceeding steadily in accordance with the programme laid down by the Electrical Standards Committee.

In the programme of work for the Radio Research Board the accurate measurement of frequency is of primary importance; with the collaboration of the Metrology Department, careful examination has been made into means of securing the highest accuracy possible in the comparison of the tuning fork used in measurements against the Shortt clock. The conclusion reached is that an absolute measurement of frequency at any instant can be made to one part in a hundred thousand; and that to reach an accuracy of one part in a million, two or three vibrators of the tuning-fork or mechanical type will need to be maintained in continuous oscillation while one of them also records continuously as a clock. The successful development of the vibration clock in the Metrology Department will probably be of great assistance in securing the highest accuracy in these measurements. Experimental and mathematical investigations of quartz oscillators continued, and the influence of the circuits associated with an oscillator on its frequency and on the power output have been carefully studied. In connection with the interferometric method† employed in examining the different modes of vibration of the quartz, a method has been devised of reproducing in relief to any scale of magnification the form of the quartz surface when in stationary oscillation. Photographs of plaques reproduced in this way by carving in relief on "Erinoid" are interesting examples of the possible modes of vibration of a quartz plate.

The Electrotechnics Division continued to be largely occupied with the further development of methods of alternating-current measurement. A new standard of accuracy in testing

* H.M. Stationery Office, price 11s. net.

† Described in the 1928 report.

and in practice has been introduced by the use of current transformers having nickel-iron cores. Whereas formerly the phase difference between primary and secondary might range from five minutes to eighty minutes of angle, according to the load, the new type of "Mumetal" transformer has a phase angle of the order of one minute down to a small fraction of its rated load. It can be used for the accurate measurement of large currents, the secondary current being a constant fraction of the primary to about one part in 10,000 at all loads.

For the purpose of such work resistors of low temperature coefficient are required, and during the year success was achieved, by co-operation with the manufacturers of the alloy and the company drawing the wire, in the production of "Constantan" (copper-nickel alloy) having a temperature coefficient within the limits of ±0.00001. By the selection of batches of wire having positive and negative coefficients resistors can be constructed, the resistance of which changes by only a few parts in 10,000 for a rise in temperature of 100 deg. C. Using this material, a shielded resistor for 40 kilovolts has been constructed for voltage-transformer testing. Air-cooled non-inductive resistors for low voltages have also been constructed giving a 2-volt drop for a current of 200 amperes, with a change in resistance of less than one part in 10,000 over the current range.

Considerable advance has been made with the installation of precision measuring apparatus in the high-voltage laboratory and high-voltage tests of insulator systems for transmission lines have been made, several in connection with designs for use on the 132-kV national grid. Tests have been made of vertical suspension insulator systems, both dry and under artificial rain; the effect of the resistivity of the water on the sparkover voltage needs to be further studied. For testing insulators in oil it has been decided to install a tank of insulating material, 14 ft. high and 4½ ft. in diameter.

In the Wireless Division good progress has been made with a considerable programme of research for the Radio Research Board, which presents features of much interest. The study of antenna systems for beam transmission has been continued and a simplified method of effecting the calculations to determine the field at varying distances has been developed. An automatic method of recording bearings from a rotating beacon transmitter has been devised.

The work of the Photometry Division has been largely devoted to the study of two main problems. For the comparison of luminous intensities, the study of different types of photo-electric cell has led to the evolution of a more suitable type, the response of which approximates much more closely to that of the eye, and further improvement in this direction may be anticipated. The advance made, however, has led to the substitution of the photo-electric cell for the eye in much of the routine standardisation work, thus eliminating the uncertainties due to fatigue of the human observer, or to differences between one observer and another. The second outstanding feature is the continued advance made in the study of glare in relation to lighting problems, under the control of the Illumination Research Committee.

In the Metrology Department, research on pivots and jewels has continued. Rusting of a steel pivot in contact with a sapphire jewel occurs in the same manner as between steel surfaces in relative motion, giving rise after a time, in the absence of a lubricant, to a great increase in frictional torque. If oil is used, rusting still occurs, but the increase in friction does not arise until after a much longer period of use.

In the Engineering Department, research on toothed gears has led to the conclusion that fatigue is the ordinary cause of failure rather than excessive load or abrasion. Further, a set of gears ground to a smooth semi-circular curve at the root had much greater endurance than the common form, although it had a considerably smaller statical breaking strength.

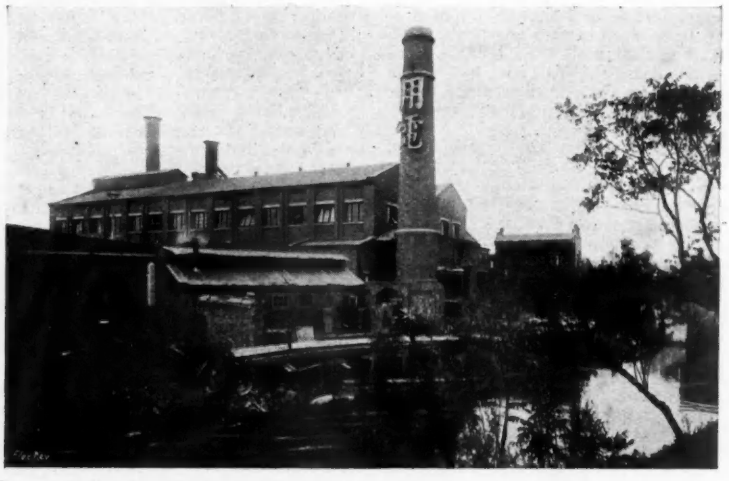
The research on springs for motor vehicles has been brought to a conclusion. The most important conclusion reached is that fatigue failure is largely dependent upon surface conditions; irregularities, decarburisation during manufacture or heat treatment, and cracks formed during heat treatment, may all have important effects, and the removal of a small layer at the surface by machining increases the life of a spring two or three times. The study of surface conditions may thus be of considerable importance, not only in relation to springs, but also with regard to materials used for many purposes; their influence on fatigue will be further investigated.

The Tientsin Electricity Undertaking.

The Chief Engineer's Report for 1929.

IN spite of very adverse conditions the Tientsin electrical engineer's report, which is reviewed below, records a very satisfactory state of affairs and speaks well of the enterprise of the Electricity Department. The accompanying photograph shows that there can be little complaint with regard to obtaining smokeless combustion. The illuminated sign on the chimney is the Chinese equivalent of "Do it electrically."

Mr R. A. Williams's report covers the year ended December 31st, 1929. The total revenue derived from the undertaking amounted to Tls. 522,882 (tael=2s. 0½d.) and the working expenditure (including Tls. 82,313 for depreciation) was Tls. 300,703, leaving a gross profit of Tls. 222,179. After providing for capital and other charges there was a net surplus of Tls. 171,968, as compared with Tls. 209,460 in the preceding year. The capital expended amounted to Tls. 129,282, the principal items being Tls. 89,147 for generating plant and Tls. 20,809 for distributing plant. For the first time in the history of the Department the sales of electricity during the year showed a decrease as compared with the preceding year, the total dropping from 8,023,485 to 7,489,845 kWh; the maximum demand also fell from 3,100 to 2,810 kW. This reduction in the consumption of electricity is stated to be caused by the acute depression in the general trade of the district, the departure of large numbers of troops and other causes. In spite of these adverse conditions, however, continued progress was made in the heating and cooking section, the sales of energy for these purposes rising from 548,401 to 630,550 kWh. Electrical refrigeration, too, is becoming more and more popular, and Mr. Williams states that there is no doubt that in a few years there will be few houses of any size in the district which do not possess a modern refrigerator. Experiments have been carried out during the last few months with a cheap yet efficient water heater entirely designed and made by the Department's staff, and the results have been so promising that heaters are being placed in residences for general use, and it is hoped that a large number will be connected during the current year. A considerable number of small domestic heating and cooking appliances were purchased during the year and great interest was taken in electrical exercisers.



The Municipal Power Station at Tientsin.

B.S.S. for Air-break Switches and Circuit Breakers.

The British Engineering Standards Association has just issued revisions of British Standard Specifications Nos. 126 and 127 for flameproof air-break switches, with or without fuses, and for flameproof air-break circuit breakers, respectively. These specifications, which are suitable for use with a.c. and d.c. pressures not exceeding 660 volts, have been reviewed by the colliery committees of the Association with a view to making them suitable for the latest requirements of the coal mining industry in this country. Provisions are included dealing with design, construction, rating, sizes and marking. The question of tests is fully dealt with, type tests being laid down for mechanical strength, breaking capacity, flameproofness and temperature rise, while special dielectric and performance tests are also incorporated. A useful addition has been made to the specifications by the inclusion, in the form of an appendix, of some notes on the problems of flameproof enclosure, which have been based upon the reports of the Safety in Mines Research Board, which are inserted for the information and guidance of purchasers and users, rather than for the instruction of manufacturers.

Copies of these specifications can be obtained from the British Engineering Standards Association, Publications Department, 28, Victoria Street, London, S.W.1, price 2s. 2d each, post free.

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus for publication in this section.

New Service Boxes.

The accompanying illustration, fig. 1, depicts the construction of a new range of service boxes introduced by CALLENDER'S CABLE & CONSTRUCTION CO., LTD., Hamilton House, Victoria Embankment, E.C.4. The box, being of the lid type, enables the jointing and bonding to be completed with the box open, and permits the clearances, joints and bonding to be examined

Fig. 1.—The New " Callender " Service Box.

before the compound is run in or the lid secured. The box provides for bonding the lead sheaths of the cables by means of bonding clamps, or, alternatively, by the use of soldered copper strips. Where bonding clamps are employed special grooved lead strip is provided to surround the lead sheath of the cable, and the gland and securing clamps are grooved to suit the strip. The groove in the lead strip centralises each separate wrapping, and thus prevents slipping, while the grooved gland and clamp ensure that these wrappings are properly secured in their correct positions. The boxes are made in seven sizes, suitable for maximum lead diameters of the main cables of from 0.709 sq. in. to 2.52 sq. in.

A Motor-cycle Trade Vehicle.

Following on the notes published in our issue of May 2nd (p. 833) concerning motor-cycle combinations that have been adopted by the Transmission and Distribution Department of

Fig. 2.—The " Cunningham Carrier."

the New York Edison Co. to replace motor-vans, resulting in a saving of from £280 to £600 per vehicle per annum, we have received from Messrs. CUNNINGHAM, LTD., 169-171, Edgware Road, W.2, particulars relating to the " Cunningham Carrier," fig. 2. This vehicle, which is claimed to be particularly suitable for quick-service work, consists of a tricycle fitted with a 5- or 7-h.p. engine and carrying a light van body measuring 3 ft. 6 in. long by 2 ft. 10 in. wide by 3 ft. deep. It will carry a load of 4 cwt., and the upkeep is reduced to a minimum. Both back wheels drive through a differential, which, it is claimed, reduces the tire wear to practically nil. The vehicle serves as an excellent advertising medium. The petrol consumption is about one gallon per 60 miles, and the tax and insurance (all risk) amount to about £6 each.

An Automatic Weigher for Pulverised Fuel.

A recent development of Messrs. W. & T. AVERY, LTD., Birmingham, is a machine for handling and accurately weighing pulverised fuel in modern boiler-house work. It has a capacity of ½ ton per discharge, and is capable of handling 40 tons of pulverised fuel per hour to an accuracy of within ½ per cent. The machine, fig. 3, resembles the standard " Avery " automatic type, but it is fitted with a top feed hopper in which is fixed a mechanical agitator by means of which a continuous and even flow of fuel is obtained—a vital factor in obtaining accurate weighings. The agitator is connected to a clutch which is thrown out of gear when suffici-

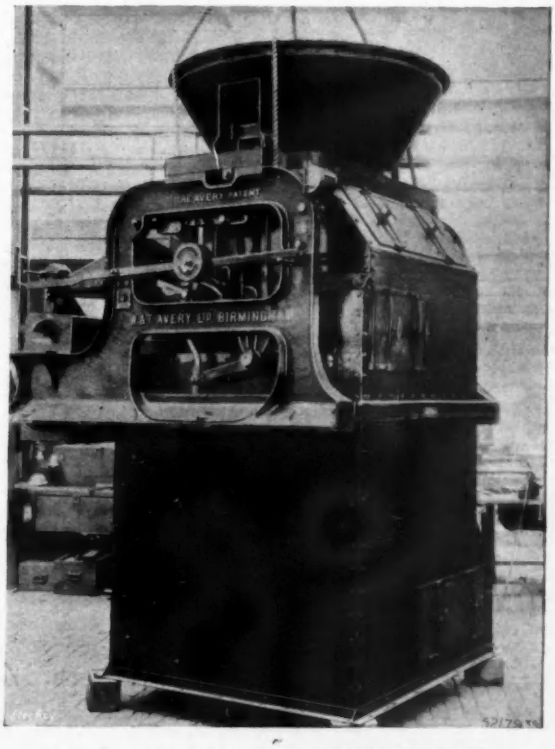


Fig. 3.—" Avery " P.F. Weighing Machine.

ent fuel has passed into the weigh hopper, and which automatically comes into gear immediately the feed valve is opened for the next weighing. The feed shoot and weigh hopper are entirely enclosed by a sheet-iron dust-proof cover which is effectively sealed to the bottom receiving hopper. In this way the flow of fuel through the weighing machine is absolutely enclosed, and there is no chance of any escaping into the atmosphere. All the working parts, *i.e.*, the mechanism, beam, &c., are outside the dust cover, and the weighing takes place freely and without hindrance. Large inspection doors are fitted to the dust cover in order that the parts of the machine, necessarily inside the cover, are easily accessible if any adjustments have to be made. By means of an air-release pipe fitted to the chute, the pressure inside the weigh hopper is the same as that on the outside; no effect on the accuracy of the machine, due to the air displacement during the flow of fuel into the weigher, is shown. The machine is fitted with a ticket-printing counter, which records on a ticket the number of weighings at the commencement and conclusion of a run.

Overhead-line Corrosion.

A survey of modern theories, recent research, and the trend of metallurgical developments with special reference to overhead electricity transmission lines.

(Report of a meeting of the OVERHEAD LINES ASSOCIATION.)

MR. G. W. MOLLE, B.Sc. (Eng.), A.M.I.E.E., in the course of his paper, pointed out that students of corrosion seemed to be divided about its causes. The high cost of replacements rendered the subject of some importance in connection with overhead lines, in which case practically all materials were continuously exposed to climatic conditions for many years. The use of non-corrodible materials was rapidly increasing, but metallurgists admitted that they were only beginning to understand the structure of metals and the mechanism of corrosion. It seemed, however, that they were on the eve of great developments.

There were two chief types of corrosion, namely, chemical and electro-chemical, and the presence of impurities, or differences of stress in metals, or changes of molecular structure, or the lodging of foreign bodies on the surface of a metal, or the occurrence of cracks, could start corrosion. It seemed quite possible that the vibration of overhead conductors, which was almost continuous, due to the wind, might cause such molecular changes as to initiate corrosion. Atmospheric corrosion depended on the presence of moisture and acid gases, or on the deposition of water and salts on a metal surface. In practice, there were two chief types of corrosion: (*a*) general, caused by acids, and (*b*) local, or pitting, caused by salt and water.

Steel containing 0.2 per cent. of copper had such resistance to atmospheric corrosion that it would lose only 4 per cent. of its thickness under conditions under which ordinary steel would lose from 70 to 90 per cent.; copper-steel was being used for constructing the transmission-line towers of the Central-England electricity scheme. The life of galvanised-steel towers and poles was anything from 14 to 50 years, according to local conditions and the excellence or otherwise of the protective coating. In a very bad industrial atmosphere galvanising was not so efficacious as painting. Some difference of opinion existed about the best method of protecting steel supports. On the one hand, it was undesirable to have to shut down a line for the purpose of painting the upper portions of the supports. On the other hand, should the galvanising come off at the top, re-galvanising *in situ* was impossible and painting over the partly corroded surfaces would not be satisfactory. In any case, painting was troublesome and expensive and must be done at intervals of from two to seven years. Therefore, for a distance of at least 2-ft. above, and for the whole distance below, ground level it was recommended that supports should be treated with bituminous paint, whether the metal was galvanised or not; but, in order to make paint to "take" well on a galvanised surface, it was necessary that the latter should be roughened, or weathered, say for six months, and then well cleaned. An excellent method of below-ground protection was to wrap the metal with tarred sacking and then surround the whole with concrete.

In the presence of moisture, corona caused the formation of nitric acid with possible deterioration of the conductors of high-voltage lines, but it was added that trouble at one time attributed to that cause was now attributed to vibration, which had been shown to occur some times, but not at others, apparently under exactly the same conditions; the subject was not well understood. The Electrical Research Association was, however, believed to be about to perfect a new scheme for the avoidance of vibration. Also the Paint and Varnish Research Association had in hand a considerable amount of research work on, among other things, the effect of vibration on the life of paint and the slow changes which occurred in it under the action of ultra-violet light, moisture, and oxygen, the effect of acids and salts, and chances of mechanical failure due to alternate expansion and contraction. Experience seemed to show that painting, at any rate so far as the first coat was concerned, should be done only by highly skilled men if the results were to justify the time, labour, money, and possibly shut-downs of transmission lines, involved.

Other forms of protection mentioned included chromium plating for outdoor overhead switchgear; the metal-spraying process was claimed to give better adhesion and more uniform coating than galvanising, an interesting application being the spraying of procelain insulators "inside and outside" as a preventative of corona, zinc, tin or copper being used. Cable-clamp jaws had also been coated with copper to overcome the inconvenience of losing loose copper linings in the field. The estimated life of sprayed-steel frameworks was 15 years, and it was also claimed that, as there was no necessity to provide for corrosion losses, comparatively light steel could be used, the saving in steel paying for the coating process. Of other methods of protecting metal, the only one of importance from the overhead-line point of view was sherardising, which formed a coating consisting of an inter-metallic compound of zinc and iron, and was useful for the protection of screw threads. The new B.E.S.A. specification No. 215/1930 included a test for galvanising which was specified in greater detail than formerly, but the general method of testing, *viz.*, the replacement of the zinc by copper from a solution of copper sulphate, remained as before.

Stainless-steel and cadmium plating were coming into use in connection with open-air switchgear. It had been found in America that aluminium wire was the best for horn-break fuses in situations where corrosion was likely to occur. If carbon tetrachloride fuses were used, the bursting of a glass tube might release the corrosive fluid and damage surrounding ironwork. In America small switch-fuses were sometimes enclosed in a housing of cypress wood, for which a life of at least 14 years was claimed, without any treatment or painting.

All stay wires and stay rods should be heavily galvanised and also painted with bituminous paint near the ground. Where insulators were provided in stay wires thimbles should be used to minimise corrosion, which was sometimes attributed to the electrolytic action of leakage currents, but was equally likely to be due to differential aeration. If stay rods were not well protected below ground, they would be liable to corrode at the ground level and also at any level of subsoil, which was intermittently wet and dry.

The resistivity of soil varied within wide limits, such as from 300 to 30,000 ohms per cubic centimetre. Although earthing troubles were far more likely to be due to that fact than to any other cause, it was nevertheless important, indeed, enjoined by the Overhead Lines Regulations, that all metal below ground must be adequately protected against corrosion. For obtaining good-conductivity earths the use of salt, copper sulphate, or simple watering were variously recommended, but probably the best practice was to use earth plates of considerable thickness and sink them 7 or 8 ft. deep, protecting the connecting wire against corrosion. Burying plates to that depth was admittedly expensive, but the fact that a plate had been sunk 3 or 4 ft. did not necessarily mean that it was a good earth. The American National Electric Code recommended 8 ft., but British regulations were silent on the point.

What was the ideal construction from the corrosion point of view? Obviously, one which contained least metal, never required painting, and in which such metal as was used was practically non-corroding. From that point of view a copper line with wood poles, wood cross-arms, wood insulator pins, and long spans would be pre-eminent, were it possible to design such a line with reasonable safety and economy. The necessity for long spans, the minimum of supports and leakage paths, and the development of conductors of great tensile strength would probably lead to the increasing use of metallic supports, and general development towards the "all-metal" line, in the same way that aircraft had advanced from the all-wood to the all-metal machine. Such lines, provided corrosion could be completely overcome, would surely provide increased reliability and decreased maintenance. In the author's opinion they could look forward hopefully to the general use of non-corroding metals at economic prices.

Discussion.

Mr. C. H. E. Ridpath (British Aluminium Co.) said that the liability of aluminium to corrosion depended very much on its purity and to a large extent on the actual conditions of wire drawing; if impurities were picked up during that process, anything might happen. Some people's ideas of pure aluminium were very different from his. Against cases of the corrosion of aluminium there were innumerable instances in which highly satisfactory results had been obtained over long periods, and he handed round specimens of conductors which had stood up under severe conditions for long periods at home and abroad.

Mr. F. Swarbrick (Basingstoke) said the efficient galvanising of switchgear and transformer casings was a most important factor, and any additional cost involved to obtain a satisfactory result would be justified. As regarded aluminium conductors, some 15 years ago he erected a line on the west coast, and when he saw it 12 months ago corrosion was negligible. The author had mentioned the possibility of corrosion taking place under bird guards, but his view was that anybody who used straight cross arms and bird guards was looking for trouble, a cross arm should be used which would not be attractive for birds to perch on.

Mr. J. H. C. Brooking said the Navy, which probably had the greatest difficulty of all with regard to corrosion, due to the saline atmosphere in which it operated, depended on ordinary paint, which was put on very thickly. It was not without interest that in places like Manchester there was no difficulty in resisting corrosion, because of the film of dirt which covered everything exposed to the atmosphere. In the case of works like those of Messrs. Bolckow, Vaughan & Co. at Middlesbrough, where there were overhead copper lines working at 500 volts, it was common practice to sling men on to the line whilst it was in operation with buckets of tar, which they put on to the lines; as long as the men did not touch positive and negative wires at the same time they were quite comfortable.

Mr. F. Christy (Chelmsford) said he had experienced trouble with electrolysis at Bude on the north coast of Cornwall. About six months after he started a three-wire d.c. installation there 22 years ago, tie wires which held the conductors on to the insulators started to be eaten away and even the main wires began to corrode at those points. Triple petticoat insulators and also oil insulators failed to effect a cure, but eventually he found a very simple solution, which was to bind some copper wire round the tie wires and down on to the heads of the insulators. The corrosion was caused by the salty deposit on the insulators. Much the same trouble had been experienced with the leading-in wires to houses and the difficulty had been got over in a similar manner. In other words, copper wire was bound at points where corrosion was found to take place in such a way that the binding wire was encouraged to corrode and so prevented the corrosion attacking the really vital portion, namely, the tie wires and cables themselves.

Mr. W. Fennell drew attention to the fact that various metals were attacked in different ways in different parts of the country, and suggested that it would be wise for the Central Electricity Board to expose samples of the metals it proposed to use for its towers and cables in various parts of the country and so ascertain the effect of the atmosphere before erecting the towers and cables. He had some structures which had been galvanised by their manufacturers and they had been up about four years, but were now beginning to show signs of rusting. He had found it impossible to get any paint to stick on and metal spraying looked as if it would avert the trouble with which he was faced. At the same time, he felt that galvanising ought to be settled in a conclusive manner. Cadmium plating seemed to offer a not very expensive alternative to zinc galvanising.

Major T. Rich (HON. SECRETARY) remarked that on the Southern Railway the tops of some of the girders were being covered to the extent of 1½ in. in thickness with some bituminous paint, so that the rivets could not be seen, to prevent the necessity for frequent painting. It was remarkable that lamp black and carbon tended to be corrosive, yet they were the basis of very many bituminous paints. When aluminium alloys were first introduced for high-voltage lines there was considerable trouble with corrosion, but he understood that the more recent alloys were much better. The tendency was to make earth "plates" in the form of a tube. Anything that was earthed for safety and yet was not really good was a delusion and a snare.

Mr. T. Stevens (CHAIRMAN) said that cadmium had been used for plating switchgear. Had anyone had experience of it in that connection?

Mr. S. D. Rudkin said that even the best galvanisers could not guarantee an even thickness, and therefore it was only a question of time before corrosion started. For brass and copper, nickel and chromium plating were being used, but the latter was out of the question for transmission lines owing to its expense. Cadmium plating had not altogether been a success; it was indeed unreliable, and he came back to the view that, if they could overcome the difficulty of galvanising (removing all traces of rust and scale and getting a good even coating) it would be the best that could be done economically in the present state of knowledge. He believed, at the same time, that certain paints would shortly be put on the market which would be a great improvement on those existing at present, and he was inclined to the opinion that all structures which were at present galvanised would ultimately be painted. His experience of bituminous paints had been unsatisfactory, because they tended to crack and peel off in the course of a year or so.

Mr. H. W. S. Husband asked whether the same preparations would be necessary for metal spraying as for galvanising, namely, that the surface must be absolutely clean, a condition which would be very difficult to obtain in the open air for the purpose of metal spraying *in situ*, as suggested by the author. In these circumstances, was it likely that metal spraying would be more effective than galvanising?

Mr. G. W. Molle, replying to the discussion, said that the effect of the atmosphere in particular districts upon the material to be used was important, and Messrs. Firth, the makers of stainless steel, always insisted that experiments should be carried out beforehand under the actual conditions of operation. His experience in India convinced him that the best paint was a black bituminous one. At the same time, where the metal poles were near the sea it was practically impossible to do anything. Mr. Bennett, of Messrs. Griffiths, had suggested to him the use of a spray gun made of a solid block of moulded bakelite, which could be put on the end of a rod and used by painters at a safe distance from the line. That, however, said Mr. Molle, might be a little difficult in practice. He was sorry to hear that cadmium plating had not been a success, because he had hoped that there would be some scope for it. The practice when metal spraying was to sand-blast the surface and to spray immediately afterwards, so that there was no time for dirt or moisture to get on to the surface. The claim for that process was that it could be carried out after the structure was erected, so that a coating was put on all over the outside. The process had been used for open-air switchgear.

The Faraday Centenary Celebrations, 1931.

Provisional Arrangements.

ON August 29th, 1831, Michael Faraday made the discovery of electro-magnetic induction. August 29th, 1931, is therefore the centenary of one of the great events in the history of the world and the greatest event in the history of electrical engineering, and is to be suitably celebrated. It is fitting that the lead should be taken in this matter by the Royal Institution, for it was to the house of the Institution in Albemarle Street that Faraday came in 1813, a youth of twenty-two, to become assistant to Sir Humphry Davy, who was then Professor of Chemistry; where later he succeeded Davy and took up the work begun by Davy, he established in the Institution the tradition of scientific research and exposition of the highest type. It is no less fitting that the Royal Institution should have the assistance of the Institution of Electrical Engineers, the body representing in this country the profession and industry which owe their existence to Faraday's greatest discovery. The two institutions have joined forces in making the plans, and a number of other societies and organisations are co-operating. The Royal Society will participate in the Celebrations; the British Association for the Advancement of Science has arranged the date of its Centenary Meeting in 1931, in London, in consultation with the joint committee for the Faraday celebrations; the Federal Council for Chemistry will participate in the arrangement of the Faraday Exhibition; and Government, University and scientific interests have joined in expressing their interest and offering assistance to make the celebrations worthy of the occasion.

Last year meetings were held at the Royal Institution to which about 60 representative institutions and associations were invited, including scientific, professional, industrial and commercial organisations having electrical, chemical or allied interests. These conferences approved the proposals to organise celebrations and authorised the appointment of committees, one to be called by the Royal Institution and the other by the Institution of Electrical Engineers, to act jointly in the arrangements. Sub-committees, to deal with hospitality, and with the exhibition and publicity, have since been appointed.

Provisional Programme.

As a result of the work of the committees a scheme for the celebrations has been drawn up and has received the approval of the Managers of the Royal Institution and of the Council of the Institution of Electrical Engineers. The arrangements will include:—By the Royal Institution: a reception of delegates at the Royal Institution. It is intended to invite representative institutions throughout the world to send delegates to the celebrations; a great Faraday Commemorative Meeting at the Queen's Hall, at which discourses will be given on Faraday's work; a conversazione at the Royal Institution, and other social functions. By the Institution of Electrical Engineers: electrical conferences of the members of the Institution and the members of all the other associations connected with the electrical industry; and a Faraday Exhibition. The central feature of the exhibition, which it is proposed to hold in the Albert Hall, and to which the public will be admitted for a period of about ten days, from September 23rd to October 3rd, 1931, will be reproductions and illustrations of Faraday's actual experiments, prepared by the Royal Institution, including a display of some of the historic apparatus. The Institution of Electrical Engineers, the Federal Council for Chemistry, and the representative organisations of the electrical and chemical industries co-operating with them, will illustrate by means of special exhibits the development of electrical and chemical science and industry in all branches which have their origin in Faraday's work.

The Faraday Commemorative Meeting will be open to all attending the Faraday celebrations, including those invited by the Royal Institution and those attending the I.E.E. Conference and the British Association meetings taking place in London at the same time. This will ensure a very large attendance.

The draft programme, which is still subject to alteration, is as follows:—

September 21st.—Afternoon: Reception of foreign and other delegates at the Royal Institution; evening: Faraday Commemorative Meeting at Queen's Hall.

September 22nd.—Morning: I.E.E. Summer Meeting begins with joint conference of the I.E.E. and allied associations; afternoon: Visits and social functions; evening: Conversazione by the Royal Institution and I.E.E. Conversazione at the Albert Hall at which the Exhibition will be opened.

September 23rd.—Morning: I.E.E. Summer Meeting and conference continued; opening of Faraday Exhibition to the public; evening: Opening meeting of the British Association at Westminster Hall.

Following days: Continuation of I.E.E. Summer Meeting and British Association meetings.

The Exhibition will be managed by the British Electrical Development Association for, and in the name of, the Institution of Electrical Engineers, and the various associations and organisations connected with the electrical industry are being asked to co-operate by providing the exhibits.

The Committee called by the Institution of Electrical Engineers is as follows:—Chairman: Col. Sir Thomas F. Purves; Commander Rollo Appleyard, Mr. Lt. B. Atkinson, Capt. J. M. Donaldson, Mr. D. N. Dunlop, Capt. P. P. Eckersley, Lt.-Col. K. Edgcumbe, Mr. H. Willoughby-Ellis, Mr. A. J. Fuller, Mr. E. Leete, Mr. J. T. Mould, Mr. C. C. Paterson, Mr. F. W. Purse, Mr. C. Rodgers, Lt.-Col. W. A. Vignoles, Mr. B. Welbourn, and Mr. A. P. Young.

The personnel of the Exhibition and Publicity Sub-Committee is as follows:—Chairman: Lt.-Col. W. A. Vignoles; Col. Sir T. F. Purves, Mr. H. Willoughby-Ellis, Mr. J. T. Mould, Mr. C. Rodgers, Sir William Bragg, Sir Robert Robertson, Professor H. E. Armstrong, Mr. W. G. Plummer, Commander R. Appleyard, Mr. A. P. Young, Mr. T. Martin, Mr. P. F. Rowell, Mr. C. Holmes Waghorn, and Mr. J. I. Bernard (Secretary).

Parliamentary News.

[By our Special Parliamentary Reporter.]

Electrically-propelled Vehicles.

On June 3rd, during the committee stage of the Finance Bill, Sir A. Lambert Ward moved to omit sub-section 1 of clause 6, which provides that "electrically-propelled" vehicles shall pay the same horse-power tax as petrol-driven vehicles unless "the electrical motive power is derived either from a source external to the vehicles or from an electrical storage battery which is not connected to any source of power when the vehicle is in motion." He said that the sub-section would tend to restrict engineering initiative and deter enterprise and invention from improving the petrol-electric vehicle.

Mr. Morrison, Minister of Transport, said that the sub-section was related to quite a restricted point. The first schedule to the Finance Act, 1926, gave a concession to a certain class of vehicles—a preferential rate amounting to 50 per cent. This concession was given only to electrically-propelled goods-carrying vehicles, and the ground of that concession was that those vehicles were slow running, that they had a restricted radius of action, and their annual mileage was, therefore, substantially lower than that of the ordinary petrol-driven vehicle. In the early part of 1927 Messrs. Tilling-Stevens brought out a petrol-electric goods vehicle. Eventually, as a result of the case being taken to the Courts, the House of Lords decided against the Government, stating that those vehicles were entitled to the 50 per cent. concession. The Tilling-Stevens vehicle was differentiated from the ordinary electrically-driven vehicle by the fact that its primary motor power was an ordinary internal-combustion petrol engine driving an electric dynamo, and the electricity generated was transmitted to a motor which drove the rear wheels through a carden shaft and differential gear, instead of the driving power being derived from storage batteries charged from a source external to the vehicle The vehicles affected did not include public service vehicles carrying passengers. It was clear that the concession was given only because of the lesser damage to the highway done by the electrically-propelled vehicle. As a matter of fact, the petrol-electric vehicle possessed the same capabilities as the ordinary petrol vehicle, and it was therefore unjust that this vehicle should be put into a different category.

In the debate which followed, many members urged the Minister to reconsider his decision. Mr. Pybus said that, by this restriction, the Minister was retarding a very fine development in electric traction work.

Mr. Morrison declined to give way, and the amendment was rejected by 273 votes to 156, and the sub-section was agreed to.

Imported Electrical Goods.

On June 3rd, Major Colville asked the Lord Privy Seal if he was aware of the large increase in the quantity of foreign electrical goods and apparatus imported into this country during the last year; and if he would consider what steps could be taken to encourage a greater use of British appliances in the market that had been created by the Central Electricity Board.

Mr. Thomas said he was aware of the increase to which Major Colville referred. It was in the main due to increased imports of the smaller type of appliance bought by the private user of electrical and radio goods. The desirability of giving preference to British goods subject to reasonable price relationship had already been brought to general notice, and he trusted that the British manufacturers and distributors would be alive to the importance of this new and expanding market.

Major Colville then asked the Lord Privy Seal if he did not think it a serious matter that this market, which had been created largely by the work of the Central Electricity Board, should be captured by foreign manufacturers. Could he consider taking any other steps which might help?

Mr. Thomas said that the difference last year as compared with the previous year was approximately 2 per cent. It was true that the work of the Central Electricity Board had created a demand, and it was equally true that the Board had given all its contracts to British firms. In addition to that he had drawn the attention of the manufacturers to the importance of their taking advantage of the market which had been created.

Mr. Kirkwood asked whether it was not the case that the British electrical appliances were the finest in the world.

No answer was given.

The Greater London and Counties Trust.

On June 3rd, Major Glyn asked the Minister of Transport if he could state what interest the Greater London and Counties Trust had in the development of electricity supply under the terms of the Electricity Act; what proportion of the capital of the Trust was British; whether the control was British; and which were the authorised undertakers that operated under the control of the Trust.

Mr. Morrison said that the Greater London and Counties Trust was not an authorised electricity undertaker within the meaning of the Electricity Acts. Information was not available as to the proportion of the capital of the Trust which was British, but, in a public statement last year the chairman said that the board of directors was and would remain British. So far as he had been able to ascertain, there were upwards of 50 authorised undertakers operating directly or indirectly under the control of the Trust.

The New B.B.C. Chairman.

On June 3rd, Mr. Lees-Smith, Postmaster-General, informed Captain P. MacDonald that the Prime Minister had recommended the Right Hon. J. H. Whitley for appointment as chairman of the British Broadcasting Corporation.

Wireless Licences.

On June 3rd, Mr. Lees-Smith told Mr. Day that the number of wireless receiving licences in force on April 30th last was 3,117,000. There were no statistics available showing how many licensees used portable receiving sets.

Employés in the P.O. Engineering Department.

On June 3rd, Mr. Graham White asked the Postmaster-General if he would state the number of employés in the Engineering Department of the Post Office on January 1st, 1930, and the corresponding figure at the latest convenient date.

Mr. Lees-Smith said that the figures fluctuated considerably according to storm conditions. The number of employés in the Post Office Engineering Department on January 1st, 1930, was 31,544. The corresponding figure on May 1st, 1930, was 32,128.

Central Electricity Board Contracts.

On June 6th, Mr. Morrison informed Mr. Albery that the value of the contracts placed by the Central Electricity Board was approximately £13,100,000. In its last annual report the Board stated that up to December 29th all its contracts had been placed with British firms.

Correspondence.

Correspondents should forward their communications* as early as possible.** ***No letter can be published unless we have the writer's name and address in our possession.

Electrical Propaganda.

It is very often suggested that in advertising the merits of any particular article, it is not good to decry the merits of competitive apparatus. Whilst I submit that this is probably all to the good in the case of articles between which there is very little to choose, yet in the case of articles or services where the merits of one are obviously superior to the other, this practice results in somewhat enfeebled publicity.

What I have in mind is the enormous superiority of electricity over gas, and the fact that the great merits of the former are not sufficiently emphasised with respect to the latter, and also to the fact that the electrical people seem to have got themselves into a kind of isolation, and so imagine that they are having things all their own way at the same time as the gas interests are contemplating the installation of "gas grid schemes."

Two particular matters which seem to me to want attention are, firstly, the definitely poisonous character of gas

and, secondly, the considerable economies that can be had by the installation of electricity. If anyone doubts for a moment the fact that gas is horribly poisonous (apart from its lethal qualities to those who wish to commit suicide) let them spend an hour cooking a meal by the best gas stove obtainable and if, in that period, they are not afflicted with headaches and a general feeling of not being "up to the scratch," it will be very unusual.

The only way that such ill-effects as these may be overcome with a gas stove would be by the installation of some form of cowl to carry away the products of combustion; this, of course, is never provided and, in the opinion of the writer, any gas stove in the average type of scullery or kitchenette attached to modern houses is a very great danger to health. Further, has anyone ever been in a room in which a gas fire is installed and not been uncomfortably aware of the fumes that are put out by that gas fire, no matter how carefully it be installed.

Although I have no figures before me relating to the matter, it is very obvious that the use of gas materially reduces the amount of air available for human needs, and with modern houses having small rooms, this also is undesirable.

As regards cost, one can actually come across engineers connected with electrical supply authorities who are not in themselves convinced that electricity can do the job of heating and lighting a house more cheaply than otherwise, and yet in one case known to the writer, the replacement of all fires, except one used for refuse destruction, and all gas fittings by electric light, has resulted in a saving of not less than £35 in a single year.

All the above points are matters which ought to be driven home to the general public, and I would suggest that these are questions which should be dealt with, with vigour by the E.D.A.

New Morton, Manchester. **J. Baggs.**
June 6th, 1930.

Published Specifications.

Compiled expressly for this journal by a firm of Chartered Patent Agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings taken.

1928.

33,474. "Control of electric motors." British Thomson-Houston Co., Ltd. (General Electric Co.). November 15th, 1928. (329,336.)
33,509. "A.c. electricity meters." S. Z. de Ferranti and Ferranti, Ltd. November 15th, 1928. (329,349.)
36,574. "Protective switching device for parallel-connected generators." G. Groeneveld. December 11th, 1928. (329,337.)

1929.

1,262. "Electrically-operated luminous diagram for the supervision of a power distributing installation." Siemens & Halske Akt. Ges. January 14th, 1928. (304,138.)
1,268. "Protective systems for underground electric cables." Soc. Anon. R. Ardigo Brevetti, I.G.S. January 14th, 1928. (304,141.)
4,331. "Manufacture of measuring apparatus of the Ferraris type, more especially electricity meters." Landis & Gyr Soc. Anon. March 23rd, 1928. (308,575.)
4,369. "Plug-and-socket and like electrical couplings." J. A. Crabtree. February 9th, 1929. (329,317.)
4,566. "Automatic battery-charging systems." Associated Telephone and Telegraph Co. February 13th, 1928. (305,990.)
4,580. "Electrical insulating materials." W. S. Smith, H. J. Garnett, J. N. Dean, B. J. Habgood, and H. C. Channon. February 11th, 1929. (329,275.)
4,868. "Electric circuit-coupling devices suitable for use with thermionic valves and the like." Marconi's Wireless Telegraph Co., Ltd. February 13th, 1928. (306,003.)
4,877. "Radio antennæ." Standard Telephones and Cables, Ltd. (Bell Telephone Laboratories, Inc.). February 13th, 1929. (329,321.)
4,881. "Continuously-loaded electric cables." Electrical Research Products, Inc. March 5th, 1928. (307,341.)
4,933. "Switching mechanisms for telephone systems or the like." Standard Telephones and Cables, Ltd., M. S. Snell, and C. P. Smith. February 14th, 1929. (Cognate application, 16,643/29.) (329,297.)
4,934. "Automatic or semi-automatic telephone systems." Standard Telephones and Cables, Ltd., and J. H. E. Baker. February 14th, 1929. (329,366.)
4,935. "Protective circuit for vacuum tubes." Standard Telephones and Cables, Ltd. May 26th, 1928. (312,336.)
4,959. "Electrical transmission systems." Standard Telephones and Cables, Ltd., W. F. Marriage, and P. R. Thomas. February 14th, 1929. (329,298.)
4,994. "Vibrating sound-producing and recording apparatus." J. W. Miller and K.N. Electrical Products, Ltd. February 14th, 1929. (329,300.)
5,007. "Mounting of electric contacts." Automatic Telephone Manufacturing Co., Ltd., and S. R. Smith. February 14th, 1929. (329,301.)
5,021. "Electrical signalling apparatus for attachment to motor and other road vehicles." W. S. Thimblethorpe. February 14th, 1929. (329,303.)
5,022. "Electric switches for use with electrical signalling apparatus for attachment to motor and like vehicles." W. S. Thimblethorpe. February 14th, 1929. (329,304.)
5,060. "Electrolytic deposition of heavy metals." M. Schlötter November 9th, 1928. (329,324.)
5,061. "Electrolytic processes and baths therefor." M. Schlötter. February 14th, 1929. (329,308.)
5,152. "Supporting arrangements for electric conductors." Automatic Telephone Manufacturing Co., Ltd., S. A. Wickerson, and F. Kessler. February 15th, 1929. (329,367.)
5,168. "Electric telephone cables." Johnson & Phillips, Ltd., and C. F. Street. February 15th, 1929. (329,327.)
5,169. "Apparatus for the determination of voltage levels and related measurements in telecommunication systems." Lignes Télégraphiques et Téléphoniques. February 18th, 1928. (306,393.)
5,284. "Electrical couplings and the like." Belling & Lee, Ltd., E. M. Lee, and W. J. Byrne. February 16th, 1929. (Cognate application, 26,666/29.) (329,371.)
5,292. "Telegraphic systems." Ateliers J. Carpentier. March 14th, 1928. (307,827.)
5,428. "Telephone systems." Associated Telephone and Telegraph Co. February 29th, 1928. (306,950.)
5,433. "Automatic switches for use in telephone or like systems." Automatic Telephone Manufacturing Co., Ltd., and W. Saville. February 18th, 1929. (329,379.)
5,447. "Method of, and apparatus for, heat-treating signalling conductors." Electrical Research Products, Inc. February 24th, 1928. (306,541.)
5,448. "Electro-optical image-producing systems." Eletrical Research Products, Inc. February 24th, 1928. (306,542.)
5,449. "Heat treatment of loaded conductors" Electrical Research Products, Inc February 24th, 1928 (306,543.)
5,450. "Telephone systems." Associated Telephone and Telegraph Co. June 29th, 1928. (314,512.)
5,514. "Electric couplings." A. Reyrolle & Co., Ltd., and A. Allan. February 19th, 1929. (329,385.)
5,840. "Electric lighters for cigarettes, cigars, and tobacco pipes." W. Fenton. February 22nd, 1929. (329,392.)
5,918. "Electric protective arrangements." British Thomson-Houston Co., Ltd., R. L. Chantrill, and F. J. Lane. February 22nd, 1929. (329,397.)
5,924. "Discharge-tube circuits for producing pulsating currents." Automatic Telephone Manufacturing Co., Ltd., and T. Blashill. February 22nd, 1929. (329,398.)
5,937. "Combined reflectors and diffusers for electric lamps." A. G. Swift. February 22nd, 1929. (329,399.)
5,941. "Automatic control of electrical power supply units." General Electric Co., Ltd., and A. E. Angold. February 22nd, 1929. (329,400.)
6,055. "Sound-transmitting and receiving apparatus, particularly applicable in navigation to recording depths or distances." A. J. L. Murray and N. Shuttleworth. February 23rd, 1929. (329,403.)
6,219. "Mercury-vapour discharge devices." Gramophone Co., Ltd., and C. O. Browne. February 25th, 1929. (329,405.)
6,256. "Safety appliances for electrically-heated apparatus." Bulpitt and Sons, Ltd., and W. H. Bulpitt. February 26th, 1929. (Cognate application, 10,138/29.) (329,406.)
6,567. "Electricity meter." Allgemeine Elektricitäts Ges. February 29th, 1928. (306,970.)
6,981. "Electrical separation of rubber from rubber latex." Siemens and Halske Akt. Ges. April 18th, 1928. (Addition to 307,747.) (309,947.)
7,201. "Portable stands for electric lamps." General Electric Co., Ltd., E. L. Randall and W. F. S. Debenham. March 5th, 1929. (329,430.)
7,749. "Control of electric switches." General Electric Co, Ltd., and A. E. Angold. March 9th, 1929. (329,425.)
7,766. "Contact fingers for electric apparatus." Electro-Mechanical Brake Co., Ltd., G. N. Cadbury, M. J. Pattison, and R. W. Purdie March 9th, 1929. (329,426.)
8,171. "Transmitters for use in telephone and sound-recording systems." Siemens Bros. & Co., Ltd., and W. E. Goodwin. March 13th, 1929. (329,429.)
8,325. "Stators for dynamo-electric machines and methods of making the same." British Thomson-Houston Co., Ltd. March 14th, 1928. (307,846.)
8,596. "System for the automatic operation of the controllers of electric traction outfits." A. D. Riccia. March 16th, 1929. (329,433.)
8,715. "Low-frequency thermionic amplifiers." S. G. S. Dicker (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). March 18th, 1929. (329,435.)
9,727. "Electric switches." H. Tinsley and D. C. Gall. March 26th, 1929. (329,445.)
9,764. "Gasfilled electric incandescent lamps." General Electric Co., Ltd., J. T. Randall, and L. C. Jesty. March 26th, 1929. (329,446.)
9,844. "Electric switches." L. Barrett. March 27th, 1929. (329,447.)
10,340. "Thermionic amplifying systems." British Thomson-Houston Co., Ltd. April 3rd, 1928. (309,044.)
11,390. "Plug and like connections for electrical purposes." Belling and Lee, Ltd., and W. J. Byrne. April 12th, 1929. (Cognate application, 11,391/29.) (329,465.)
11,643. "Automatic means for synchronising dynamo-electric machines." D. W. Hute. April 15th, 1929. (329,471.)
11,929. "Electric plugs." R. Mayrshofer. April 21st, 1928. (310,042.)
12,489. "Electric heating elements." H. Wade (Moffats, Ltd.). April 22nd, 1929. (329,478.)
13,934. "Loud speakers." C. P. Hall and T. Hough. May 4th, 1929. (329,493.)
14,440. "Radio-receiving apparatus." L. L. de Kramolin. May 8th, 1928. (Patent of addition not granted.) (311,295.)
15,394. "High-frequency duplex signalling systems." C. Lorenz Akt. Ges. May 18th, 1928. (312,079.)
15,577. "Electric switches." F. Chambers and C. Andrews. May 18th, 1929. (329,510.)
15,637. "Electric selective arrangements for operating alarm devices." Soc. Française Radio-Electrique. May 22nd, 1928. (Addition to 301,753.) (312,234.)
15,761. "Radio apparatus." J. A. Hanson. May 21st, 1929. (329,512.)
16,476. "Alternating-current electric motors." H. C. E. Jacoby and N. W. Gilbert. May 29th, 1929. (329,517.)
16,515. "Electric cooking ovens." C. R. Belling. May 29th, 1929. (329,518.)
17,136. "Electrically-operated monogrammic apparatus for advertising purposes and the like." Day and Night Novelty Ads., Ltd. June 20th, 1928. (313,956.)
17,193. "Vacuum-tube sets." L. L. de Kramolin. June 1st, 1928. (313,013.)
18,724. "Method for picture transmission." C. Lorenz Akt. Ges. July 24th, 1928. (316,178.)
19,037. "Methods of fixing connecting wires to electrical resistances." I. Silberstein. June 30th, 1928. (314,529.)
19,128. "Arrangements for heating the cathodes of valves and other discharge tubes." Telefunken Ges. für Drahtlose Telegraphie. June 23rd, 1928. (314,088.)
20,628. "Detachable plugs or adaptors for flexible electric conductors." Hoover, Ltd. (Hoover Co.). July 5th, 1929. (329,559.)
20,749. "Commutator connections for dynamo-electric machines." Maschinenfabrik Oerlikon. August 29th, 1928. (318,169.)
21,364. "Electric conductor, consisting of cable core and one or more outer layers." Metallges. Akt. Ges. October 15th, 1928. (329,561.)
23,291. "Mounting of electro-magnetic relays, shutter indicators, and the like." Telefonaktiebolaget L. M. Ericsson. August 4th, 1928. (316,875.)
23,548. "Amusement devices employing electrically-driven vehicles." H. Souplis. August 1st, 1928. (316,625.)
23,654. "Process for stabilising non-crystalline, piezo-electric microphone plates." Telefunken Ges. für Drahtlose Telegraphie. August 1st, 1928. (316,628.)
24,634. "Combined pneumatic and electric power conductors." Aktiebolaget Separator. September 1st, 1928. (318,244.)
24,955. "Loud speakers." S. Schoenberg. August 15th, 1929. (329,582.)
26,103. "Lamp-bulb holder for miners' electric lamps." Concordia Elektricitäts Akt. Ges. July 19th, 1929. (329,586.)
27,579. "Electric switches." J. B. Tucker. September 11th, 1929. (329,597.)

Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from June 4th:—

Superwasp (lettering and design). No. 508,891. Class 8. Radio-telephonic and telegraphic apparatus and parts thereof.—Pilot Radio & Tube Corporation, Brooklyn, N.Y., U.S.A. (British representatives: Frank B. Dehn and Co., Kingsway House, 103, Kingsway, W.C.2.)

Double Eagle (lettering and design). No. 510,448. Class 8. Electrical storage batteries (not for medical purposes).—Goodyear Tire & Rubber Co., Akron, O., U.S.A. (British representatives: Mewburn, Ellis & Co., 70-72, Chancery Lane, W.C.2.)

Golden Ray (lettering and design). No. 511,617. Class 8. Apparatus for use in radio-telegraphy and telephony.—A. Rist (1927), Ltd., Freemantle Road, Lowestoft.

Torex, No. 511,905, and Zalma, No. 512,005. Class 8. Philosophical and scientific instruments and apparatus for useful purposes.—Lissen, Ltd., Isleworth, Middlesex.

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

ABERDEEN.—Rehousing scheme (200) for T.C. (£66,000); city architect.

ACCRINGTON.—Police and fire stations for the T.C.; Percy Thomas, architect, Cardiff.

ARBROATH.—Cinema for Arbroath Cinema Co.; secretary.

AUDENSHAW (near Manchester).—Secondary school for Lancashire C.C. (£33,000); E. Rangeley, contractor, Merrigold Street, Rochdale.

AYR.—'Bus station, garage, and officers for Ayr and District Motor Services, Ltd.; secretary.

BARKINGSIDE.—Development, Moddford Green estate; Marrable Bros.

BEACONSFIELD (Bucks.).—Housing scheme (124) for the U.D.C.; J. Crosby, surveyor.

BEXLEY HEATH.—Girls' central school for the E.C.; director of education.

BRADFORD.—Remodelling and extending Thornbury school (£10,000); city architect.

BRENTFORD.—Houses (35), Isleworth estate; U.D.C. surveyor. Factory extension, Great West Road; Commercial Ignition Co.

CARLISLE.—Extension of sewage disposal works; city engineer.

CHELTENHAM.—Houses (52), St. Mark's estate; Mr. Rainger, architect.

CHESHUNT.—Houses (139) for the U.D.C.; surveyor.

CRANBROOK.—Houses (40) for the R.D.C.; Capt. Lewis, surveyor.

CROYDON.—Beulah School, Thornton Heath (£32,850) for the borough E.C.; F. R. Hipperson & Sons, builders, 6, Broad Street Place, London, E.C.

DEAL.—Houses (50) for Snowdown Betteshanger Tenants, Ltd.; Fawcett Martindale, architect, St. Neot's, Deal (returnable deposit of £2 2s.).

DONCASTER.—Central schools (£40,918) for the borough E.C.; W. Firth, Ltd., builders.

DUDLEY.—Works extensions, Churchfield Mills; Dunlop Rubber Co., Ltd.

DUNFERMLINE.—Cinema; Peter Crerar, motor engineer, Crieff, Perthshire.

EAST RIDING.—Mental institution, Brandsburton Hall; East Riding C.C.

ELLESMERE PORT AND WHITBY.—Houses (232) for the U.D.C.; E. B. J. Gould, Ltd., builders.

ENFIELD.—Estate development, East Barnet Road; Rowley Bros.

EPSOM.—Villa, Maudsley Hospital (£11,590); L.C.C. architect.

EXETER.—College hostel for the Council of the University College of the South West; E. V. Harris, architect, 29, St. James's Square, Pall Mall, S.W.1.

GLASGOW.—Reconstruction, Caldwell House (£25,000); Glasgow District Board. Additions and reconstruction of premises for North British Locomotive Co., Ltd.; manager.

HANTS.—Schools, West End and Chilworth, for the E.C.; director of education, Winchester.

HEYWOOD.—Houses (60), Peel Lane; J. B. Nuttall, borough surveyor, Municipal Buildings (deposit £1 1s.).

HULL.—Tenements, George Street area (£11,000); schools, Westcott Street (1,320 places) and Eastfield Road (520 places); and extensions, Hall Road school; city architect.

ILKESTON.—Sewage works (£57,000); H. P. Raikes, consulting engineer, Birmingham.

IRISH FREE STATE (Drogheda, Co. Louth).—Houses (40); J. J. Gogarty, builder, West Street.

(Monaghan).—Alterations and additions to Courthouse for Monaghan County Council; J. F. McArdle, architect.

(Westmeath).—Electrical installations at Courthouses, Mullingar, Athlone, Moate, and Kilbiggan for the County Council; J. P. Tierney & Co., consulting engineers, 44, Kildare Street, Dublin.

(Dublin).—Houses (90), Marrowbone Lane district, for City Commissioners; city architect, Exchange Buildings, Lord Edward Street (returnable deposit of £5 5s.).

KIDDERMINSTER.—Houses (50), Marpool Lane, for R. Hill.

LEEDS.—Pathological institute, St. George's Road; J. C. Procter and F. L. Charlton, architects, 40, Clarendon Road. Tenders by June 20th to the Registrar, The University, Leeds (deposit £2 2s.).

LITTLEHAMPTON.—Remodelling Palladium and the Electric cinemas; G. G. Wimborne, architect.

LIVERPOOL.—Block of 10-storey tenements (with lifts); land steward and surveyor, Municipal Buildings, Dale Street. Out-patients' department, St. Paul's Eye Hospital, Oldhall Street; H. J. Rowse, architect.

LONDON (Ilford, E.).—Houses (40), Eton Avenue; E. Glenney & Son. Houses (34), Hine Gardens; S. F. Siegerts.

(Barking, E.).—Schools (£70,000) for the E.C.

(Finchley, N.).—Estate development, Ardeen estate; G. C. Swanson.

(Lewisham, S.E.).—Houses (58), Bexhill Road and Salehurst Road; G. T. Harman.

(Southwark, S.E.).—Tenements, Moss Alley area (£46,456); W. Lawrence & Son, Ltd.

(Fulham, S.W.).—Flats (375) and shops (14), Swan brewery site (£275,000); borough engineer.

(Park Lane, W.).—Shops and flats, Aldford House site, Park Lane; G. Val Meyer, architect.

(Covent Garden, W.C.).—Theatre, National Sporting Club site; Felix Goldsmith, architect.

MAIDENHEAD.—Town hall (£50,000), for the T.C.; borough surveyor.

MANCHESTER.—Senior school, Gorton Mount (£39,440) and reconstruction Birley Road school (£19,000); city architect.

MOUNTAIN ASH.—Employment exchange for H.M. Office of Works, King Charles Street, London, S.W. (returnable deposit of £1 1s.).

OLDHAM.—Tenements, Smethurst Street area; borough engineer. Administrative and dining blocks, Strinesdale Sanatorium, for Corporation; Taylor & Simister, architects, 29, Queen Street. Works extensions, off Connaught Street; Geo. Orme & Co., Ltd.

OXFORD.—Houses (68), Rise Hill estate; N. Moss & Son. Pumping machinery, Beacon Hill waterworks (£17,416); Davey, Paxman & Co., Ltd., Colchester.

PATELEY BRIDGE.—Housing scheme (28); R.D.C. surveyor.

PERTH.—Alterations, King's Cinema, for Perth Picture House Co., Ltd.; manager.

REIGATE.—Houses (200) for the T.C.; borough surveyor. Health centre for the T.C.; David J. Barry, architect. Extensions, municipal buildings; Hugh Macintosh, architect.

RICKMANSWORTH.—Masonic schools; Denman & Son, architects, Brighton.

RUGBY.—Cinema, Newbold Road and North Street, for Manchester syndicate; J. F. Emery, Bolton Road, Pendleton, Salford.

SCUNTHORPE.—Public baths, Doncaster Road (wiring for electric lighting and power); W. Farrar, engineer and surveyor, Council Offices. Tenders by June 18th to J. F. Auld, clerk to Council (deposit £2 2s.).

SHEERNESS.—Improvements, Oxford Cinema; L. H. Kemp, architect.

STOCKPORT.—Bank, Great Underbank, for Lloyd's Bank, Ltd.; Newton & Ward, 168, Oxford Road, Manchester.

STOCKSBRIDGE.—Housing scheme, May House estate; W. Memory & Son, builders, Sheffield.

STOKE-ON-TRENT.—Operating theatre, Isolation Hospital; P. Pemberton Tunstall.

THAKEHAM (Sussex).—Waterworks engine and filter houses, with pumping machinery, &c., for the R.D.C.; H. Bertram Nichols, engineer, 13, Victoria Street, Westminster, S.W. (returnable deposit of £5).

UXBRIDGE.—Houses (200) for U.D.C.; W. L. Eves, architect.

WHITEFIELD.—Junior and infants' school; secretary, Prestwich and Whitefield Education Sub-Committee.

WILLESDEN.—Houses, Dollis Hill estate, for Lennox, Ltd.; D. W. Beck, architect.

WOKING.—Reconstruction, Grand Theatre; F. W. Kinns, architect.

WREXHAM. — Extensions, Majestic Cinema Theatre (£15,000); manager, Regent Street.

YEOVIL.—Re-erection of Central Cinema; A. S. Thring, proprietor.